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Journal of the Society of Arts.

FRIDAY, MAY 23, 1856.

ANNUAL CONFERENCE AND DINNER.

The Annual Conference of the Representatives from Institutions in Union with the Society is appointed to be held at the Society's house, on Monday, the 23rd of June.

The Annual Dinner will take place at the Crystal Palace, on Tuesday, the 24th of June.

Further particulars will be announced in an early number of the *Journal*.

OFFICE OF ASSISTANT-SECRETARY.

The office of Assistant-Secretary of the Society of Arts will be vacant at the end of June, its present holder, Mr. James Forrest, having been appointed to the Institution of Civil Engineers. The Council have resolved that the office shall be thrown open to competitive examination. The particulars will be announced without delay in the *Journal*.

HONORARY LOCAL SECRETARIES.

The Council have resolved to appoint Honorary Local Secretaries of the Society of Arts in the several provincial cities and large towns of the United Kingdom. The Society of Arts has long felt the need of authentic sources of local information and the want of provincial co-operation.

The approbation with which its measures have been generally received, proves that the sympathies of the country, when elicited and tested, are with it. But sympathy is not enough,—active co-operation is required. There are besides many subjects of national and local importance on which accurate information in abundance exists, but it cannot be turned to general account because not generally known.

To multiply the centres of the Society's operations, and to direct the energies of many who are prepared zealously to aid the Society, if they could but see the way to do so, the Council propose to invite gentlemen of standing and of influence in their respective neighbourhoods to undertake the office of Honorary Local Secretary of the Society of Arts. They will receive the Society's *Journal* and other published documents from time to time; and the facilities of an office for receiving and forwarding letters, books, &c., will be afforded them at the Society's House in

the Adelphi. The Honorary Local Secretaries will be expected to advise the Council on such matters as may be submitted to them, and to afford generally their aid in promoting the objects of the Society. They will go out of office annually, with the Council and Officers, but may be re-appointed after the annual election of the Council of the Society. Their names will be published with those of the President, the Vice-Presidents, the Council, and the Officers of the Society.

HONORARY LOCAL SECRETARIES ELECTED BY THE COUNCIL ON THE 21ST MAY, 1856.

William Sands Cox, Esq., F.R.S., for Birmingham.

John Waterhouse, Esq., F.R.S., for Halifax.

Henry Newall, Esq., for Rochdale.

THE BRUSSELS ECONOMIC EXHIBITION.

The Committee appointed by the Council of the Society of Arts in aid of the Economic Exhibition to be opened at Brussels on the 25th of August next, has received very favourable communications from the Belgium Commissioners. Promises of contributions have been sent in from Germany, Switzerland, France, and Holland, and the Commission being particularly desirous of securing the co-operation of British manufacturers in this undertaking, has used every endeavour to render it deserving of their support, both in a commercial and in a benevolent point of view. This Exhibition is to be held in connection with an International Congress, for promoting health and comfort among the poor; it is intended to form the ground work of a permanent economic museum, and it will comprise specimens or illustrations of articles or contrivances which may enable the working classes to improve their condition as to their dwellings, furniture, and household utensils, their food and clothing, their industrial pursuits and their intellectual development. As the Exhibition will be visited by a number of individuals from various countries, and the catalogue will be widely circulated, this will amount to an extensive advertisement in favour of the exhibitor. The Belgian government has agreed to deduct 50 per cent. from the usual railway charges, and the Exhibition Commission will bear all charges in Brussels—such as cartage, stalling and exhibiting the goods.

Should the exhibitor desire to sell his articles, the Commission offers assistance for that purpose.

Contributions may be consigned to Messrs. Mertens Krupel and Co., 8, Catherine-court, Seething-lane, London, the agents for the Belgian Commission. If the articles are to be returned to England at the close of the exhibition in October, the expense of conveyance to and from Brussels will be borne by the contributors; the charge from London to Brussels will be at the rate of one shilling per cubic foot. The same will be charged for the return of goods from Brussels.

If the articles are presented as donations to the Belgian Government for being exhibited permanently in the proposed museum, the contributor will incur no trouble or expense beyond consigning his contributions to Mertens Krupel and Co.

No customs duties will be charged unless the articles are sold in Belgium.

A detailed programme of the Exhibition has been translated into English, and may be had on application to the Secretary of the Society of Arts.

EXTRA-ORDINARY MEETING.

FRIDAY, MAY 16, 1856.

An Extra-Ordinary Meeting was held on the evening of Friday, the 16th inst., for the purpose of resuming the discussion upon Mr. Braithwood's paper on "Fires; the Best Means of Preventing and Arresting them, with a few words on Fire-proof Structures." John Thwaites, Esq., Chairman of the Metropolitan Board of Works, presided, as on the former occasion.

The Secretary asked permission to read to the meeting several communications which he had received, having reference to the subject under discussion. These were

FIREPROOF, NON-COMBUSTIBLE, AND FIRE-EXTINGUISHING BUILDINGS.

By W. BRIDGES ADAMS.

The building of cities might be, but is not, a philosophical process. They have usually grown out of accidental circumstances united with peculiar localities, not having reference to all the wants of man. The general requirements in a city are—good drainage, either natural or artificial; well-formed and paved streets, with the minimum of dirt, and the greatest facility for walking and traction; complete ventilation, only to be attained by the streets being all thoroughfares, and the width of the streets being at least twice the height of the houses; convenient arrangements for warmth indoors; and absolute incombustibility in the buildings.

Walls are made perfectly incombustible of brick and mortar, but they are not incapable of destruction by the agency of burning materials, because, by the action of fire the mortar returns to its original condition of quick-lime. To be perfect, they ought to be of fire-stone or brick, cemented with fire-clay.

Floors may be made of groined brick arches, resting on brick pillars, but, to be indestructible by fire, they also should be built without lime mortar.

But such floors and supports would be a great waste of space; therefore, flat floors are required, either spanning from wall to wall, or supported at intervals by pillars of small size.

The only material of which flat floors can be constructed is, beams of iron, and wrought iron in preference, as being many times stronger with equal bulk.

But inasmuch as iron is capable of being damaged by the combustion of burning material in contact with it, it becomes necessary to surround it with non-combustible material, capable of withstanding great heat.

The floors known as Fox and Barrett's are constructed of wrought iron beams covered in with concrete. The thickness of the concrete is very important; but as lime enters into the composition, continuous heat of sufficient intensity would gradually destroy the iron.

Fire brick and clay in sufficient masses would render such a floor indestructible by fire.

The only objection to such floors is their great weight.

Where no mass of combustible material exists in the building, floors of sawn slate may be applied; the joints being caulked with elastic material. The roofs might be constructed flat on a similar principle, with great economy in structure, and with the advantage of adding another

floor gratuitously, either as an open terrace, or to support a greenhouse. Between the ceiling and the slate roof air might circulate in warm weather, and be a fixture in cold weather.

The floors being hollow, would serve for the passage of air for warming and ventilation.

The staircases could be either of sawn slate or of metal bars built into the walls and covered with fire-bricks.

As regards warming, two classes of heat are required—warm summer heat, in the form of flowing air; and radiant heat, for warming the extremities of the body, or for the purposes of cookery. The heat that is healthy for the lungs is insufficient for the feet for those following sedentary employment.

No building can be healthy that is not warm and dry; and the conditions of dryness and warmth are precisely the conditions essential to rapid combustion and the destruction of combustible buildings by fire.

The Houses of Parliament, the Royal Exchange, and other public buildings, were burnt down, because, being combustible, they were unfitted to be warmed by the modern processes of heated air, which dried all the wood-work to a condition of tinder after being some time applied.

It is, therefore, important, even in a sanitary point of view, that all buildings be fireproof, and the same kind of dryness is also important in warehouses.

For the supply of warm air, it would be much better to produce it in a separate building, and supply it by meter to a whole neighbourhood, just as gas is supplied. This will probably be some day accomplished, and the air will be drawn from as great a height as possible, for the sake of purity.

For radiant fires, whether of gas, coal, coke, or other material, chimneys are essential. Chimneys, as ordinarily built, are formed of bricks, the horizontal joints of which are close, while the vertical joints are open, or only closed with a covering of what is called "pargetting," a mixture of mortar and cow-dung. The object of this is to prevent shrinking and cracking. Gradually the cow-dung burns out, the "pargetting" falls down in a crumble, the joints are open and draw air, the chimney smokes, and fire may thus get access to the floors.

To make accurate chimney flues, the interior should be lined with a flattened tube of iron or of pottery; if glazed inside, so much the better. Near the fire the tube should be of fire-clay; and wherever heat penetrates, fire-bricks and fire-clay should be used instead of ordinary bricks and mortar.

We occasionally see original bad chimney constructions caked out by tall zinc chimney-pots. In cold weather, the air is condensed within them, and forms a practical stopper to prevent the smoke from ascending. If these zinc pots were made double, with half an inch of air-space between, the result would be a warm chimney, and this class of evil would be amended.

It is obvious that a building thus constructed might be roasted inside with any amount of gas or hot air without sustaining damage. The only fire must arise from the furniture.

It may be objected that the floors would be cold without boarding. But thin wood parquetry, saturated with non-combustible solutions, might be used to cover them. Neither this, nor woollen carpets, nor woollen curtains could aid fire.

Furniture, as chairs, beds, and couches, might all be of elegant iron-work. Table-tops might be of marble, slate, or metal. Linen, books, and other articles, could not be in sufficient quantities to aid combustion.

A building such as described, if built with solid floors, would be fireproof. But an iron building, well constructed, though not fireproof, would be incombustible, and if furnished with incombustible materials, would be very desirable where ground-rents are dear, and space is limited, on account of the extreme thinness practicable with double walls of metal.

It may be remarked that this class of building will answer very well for dwellings, but would be useless for warehouses on account of the mass of combustibles.

Let us consider this question. Warehouse goods consist of explosive materials, rapidly combustible, and slowly combustible. Explosive materials, it is clear, should not be permitted at all in cities, and rapidly combustible materials should either be separated into small quantities, or the building in which they are placed should be isolated by fireproof external walls, from all other buildings. Bales of cotton, cylindrical in shape, and with air spaces between them, are among the most combustible materials, but woven cloth closely folded, books and paper in reams, and similar materials are very difficult of combustion.

There is no doubt that the most convenient form for a warehouse is four external walls, with the floors supported internally on columns, and central wells opening through them from top to bottom; and the larger the warehouse the more economical is the building. But the Building Act prescribes that it shall be divided by party walls into small portions, whatever be the class of goods to be warehoused. And even iron beams and columns are objected to.

The problem to solve is, to make the columns and beams fireproof, and to make the fires that may happen self-extinguishing. If the floors be formed with brick and fire-clay, and the columns be surrounded with the same material, and the brick surrounded with sheet-iron, to prevent wear, that first object will be accomplished. There is no more difficulty in making the building fireproof than in constructing one of Milner's fireproof safes. The central wells should all be fitted with sliding iron trap-doors. The stair-heads should close with wrought-iron doors, the windows with wrought-iron shutters.

Nor is there any great difficulty in so arranging that the fires may help to extinguish themselves. The warm air, which should freely circulate in the day-time, to keep the goods dry, should be cut off at night; and with closed doors and windows, if fire happened, it would probably suffocate itself. But we must also calculate for carelessness, the leaving open doors and shutters, and, therefore, other means must be provided.

On the roof capacious cisterns should be provided, with descending pipes communicating with a series of parallel horizontal pipes, or a network of pipes covering over and attached to each ceiling. From these ceiling pipes, say three inches in diameter, should project downwards, an inch or two apart, a series of fusible tubes hermetically sealed. In case of a fire, the fusible tubes would burn away with the ascending flame, and the water would pour down vertically on the flames and burning goods.

The roof cisterns should be connected with external pipes, communicating with the street mains, under pressure, or with engines, which would thus become force pumps, carrying the water to the extreme height of the building. Thus, provision could be made for pouring water directly into the fire; and combings, like ships' hatches, being provided for the staircase and well, on each floor, with an exit pipe, no damage could be done by water running from the storey on fire to those below it. Only that part would be drowned which it would be desirable to drown. Each floor would be like a huge tray holding a given quantity of water, with a waste-pipe to prevent it from running over.

Now, let us see what objections can be found to such a simple system.

First. That in process of time the pipes might become clogged with sediment. This might be guarded against by having exit cocks on every floor, and running off the water not every night or every week, but say on the first of every month. And as a further security no water should be used in the premises but that passing through the pipes. Daily necessity would thus ensure against neglect.

An illustration. A gentleman residing in the country had his house cisterns supplied with water by a force

pump in a well. One cistern supplied the stable and garden; another the house, the groom and gardener having it in charge to fill the house cistern as well as their own. As a result, the house cistern was constantly empty, and the cook and other servants quarrelling with the groom and gardener. The master, after some change of servants and vain exhortations to regular duty on the part of the equine and horticultural representatives, bethought himself of going to the root of the evil. So sending for the plumber, he caused the whole supply to pass first into the house cistern and thence into the stable cistern. Nothing ever went wrong afterwards save in time of frost. Neither groom or gardener could supply themselves till the house had its allowance.

With regard to frost. Water pipes burst. But there is a remedy for this. As a matter of course a very large warehouse has a watchman. For his own sake he will take care to have a good fire if he can get one in cold or frosty weather. If his only fire be the furnace fire, used to circulate the water in the pipes, which may serve to warm or partially warm the building, he will take good care to keep that fire going for the sake of his own pleasant sensations, and the constant warning of the pain of cold. This arrangement would certainly make a self-acting watchman, and there does not seem any reason why the apparatus should get out of order.

If cities were built on such a system, it is quite clear that there would very soon be an extinction of Fire Assurance Companies. The existence of risk is an essential principle to induce assurance, and without supposing that shareholders in such companies are worse men than their neighbours, it is evident that the continuance of a profitable business must depend on occasional fires to such an amount as will keep the general mass of building owners in an uneasy condition. Even mutual assurance companies cannot help being pleased with an occasional destruction of property—not involving life—which may bring grist to their mill. It is the very principle of competitive trade.

Fire insurance offices are, in short, either a silent satire on the human ignorance which erects dangerous buildings fitted for burning down, or an indication of poverty of power as regards capital, or poverty of invention, or both.

With regard to cost. If the legislature, deeming it right to guard human health from unwholesome buildings, as well as human life from dangerous buildings, should determine some day that all future buildings must be noncombustible, a great impulse will be given to the production of iron, brick, and stone, natural and artificial, and noncombustible buildings will come to be cheaper than combustible ones. They are, in fact, cheaper at present, if we take into account—insurance—doctor's bills—repairs—and inconveniences of all kinds; saying nothing of the process of being burned in bed, and the concomitant taxes for fire escapes and other patch-work contrivances.

It is quite true that we cannot all at once get rid of our present dangerous buildings, but we can establish a principle, and, to a considerable extent, we can make it self-acting, by promoting the extension of non-combustible iron buildings in those situations where ground is costly, as in the city of London. For example:—Suppose a site 20 feet by 40 feet, and the four walls to be each 18 inches thick in brickwork, twenty per cent. of the area is lost, or about 170 feet out of 800 feet. If the walls be of double iron, and only 6 inches in thickness, the loss in area will be little over 6 per cent., or about 50 feet out of 800 feet, being a saving of 120 feet as compared with brick. If this be multiplied by five stories, we have a saving in space of 600 feet total, or nearly 67 square yards. When we think of the almost fabulous prices of City building sites, and multiply this result of one building by the whole of the buildings in the city, it is practically equivalent to the creation of so much new land—67 square yards on a base area of 89 yards.

This is a question very imperative for the consideration

of the Metropolitan Board of Works, and the adoption of such a principle would give rise to new improvements in preserving iron from oxydation, and possibly to some new kind of compound metal, not subject to rust; at any rate, to a cheap and effective process of bituminising, as a substitute for the miserable wash of zinc called galvanising, which gradually disappears in a surface of red rust. The tin-plated roofs of Montreal and Quebec, flashing in the rays of the sun like a silver city of romance, are infinitely preferable to this. Tin is a metal not easily oxydised, and shelters the iron hermetically. Zinc being a metal easily oxydised, shelters the iron only by opposing its own substance to be devoured instead, as a kind of scapegoat. The oxydised zinc then rubs off, exposing a new surface, which is eaten in turn, till finally the iron is left exposed to the full action of the oxygen.

If we examine the various structures exposed to the continual action of fire, we shall find a locomotive boiler fire-box one of the most durable, considering the intensity of the heat. In a case of necessity, for an absolutely fire-proof building, it would be possible to attain it on this principle. With hollow walls, hollow floors, and hollow columns, all communicating and filled with water, supplied by an over-head cistern, the whole building would be water-clad. Consequently, any heat on the surface of the metal would be communicated to the water, and thus pass off without the possibility of the iron getting heated up to burning or melting point. The heat of the fire might thus cause the water to boil over at a certain level and put the fire out.

Examining the whole question of fire risk philosophically, we are constrained to regard fire extinguishers and fire escapes of all kinds, as mere temporary means or expedients to work on with a very imperfect system of building, and that our true policy is to work onwards as fast as we can, towards a perfect building system. We are fast abandoning combustible materials in ships, mainly induced by the greater internal space we can attain with iron, the greater safety from fire being only a contingency. Precisely the same principles hold good in crowded cities with high-priced land.

But as long as combustible buildings shall continue, there can be no question that the steam fire-engine is the best; and, if rightly constructed, the steam can be got up as rapidly as the horning and water connecting, and other arrangements.

THE FIRE-ANNIHILATOR AS A MEANS FOR SUPPRESSING FIRES.

Office of the Fire-Annihilator Company,
105, Leadenhall-street, London, 13th May, 1856.

SIR.—The paper by Mr. Braidwood, on "Fires: the best means of preventing and arresting them, &c.", read before the Society, on the evening of Wednesday, the 7th inst., and the discussion which followed the reading of the paper, present points of the greatest interest to us, whose attention has been specially directed for several years past to the promotion of an improved means for suppressing fire.

The object of the Society in inviting discussion on the very important subject of Mr. Braidwood's paper, is to draw out facts and opinions for information and record.

We noted two points of great interest in connection with the subject as requiring notice on our part. We conceive that we shall promote the object in view by laying before the Society the observations which those points suggest; and, therefore, submit to you for presentation to the meeting, on Friday evening next, the following communication.

The two points which the paper and the discussion presented to us are—1st. The omission by Mr. Braidwood of any reference to the fire-annihilator or vapour fire-engine. 2nd. The suggestion that the fire offices are not interested in suppressing fires.

1st. The omission by Mr. Braidwood of any reference

to the fire-annihilator, is equivalent to an expression of opinion that the fire-annihilators are useless as a means of suppressing fire—such opinion has, in fact, been on several occasions expressed by Mr. Braidwood. The opinion of that gentleman—based on a very large experience—is worth the utmost value which any opinion can carry; but (and we feel assured that the Society will assent to the proposition which we put forward) *no man's opinion is worth a straw in the face of facts.* We will now produce such evidence of facts of use of fire-annihilators, at casual fires, both by firemen and by inmates, as shall satisfy the Society, not only that Mr. Braidwood is without justification for the omission from his paper of all reference to the fire-annihilator, but, further, that he is without justification for neglecting to adopt these improved means for extinguishing fire for the use of his Fire Brigade.

The several cases of use of fire-annihilators, at casual fires in buildings, from April, 1851, to the present date, number 38, ranging from the serious chimney fire to the fire in the uninsurable premises of the Imperial Patent Wadding Company, Manchester.

These cases may be divided into four classes, viz.:—use by Leeds Fire Brigade; use by Gravesend police; use by firemen of Fire-Annihilator Company; use by inmates.

The machines have been in use by the Leeds Fire Brigade since the beginning of the year 1852. A "fire-annihilator" carriage, containing six hand machines, with a large machine on wheels attached, has the first pair of horses, and precedes the fire-engine to the fire. Another large machine, on wheels, is attached to the fire-engine.

In February, 1853, the superintendent of the Leeds Fire Brigade testified as follows:—"From the practical experience I have had, I cannot hesitate to bear my testimony to the utility and value of the fire-annihilators, particularly for the use of a fire brigade in aid of the engine; as by means of these, flame is instantly got under, and the dense smoke absorbed or dissipated, and thereby the efforts of the firemen most materially aided, and premises and stores saved from wasteful damage by water." Mr. Superintendent James has since declared that subsequent experience has confirmed the opinion above quoted.

The following is a short notice of cases of use by the Leeds Fire Brigade:—In three cases, model shop of a machine-maker (two storied building); wing of a flax mill, (three storied building); hemp and flax dressing shop, (large two storied building); the fire is described to have gained head before the arrival of the Brigade—flames ascending to a great height above the buildings. The machines extinguished the flames instantaneously, and brought the fire within manageable compass. In the case of a builder's dry house, connected with a joiner's shop and timber-yard, the flames which had reached a great height were instantly extinguished, "in fact," Mr. James writes "it was similar to putting an extinguisher on a lighted candle." In two cases—a hay and straw store—a private dwelling house—the difficulty was smoke. The machines enabled the firemen to enter the buildings, and trace out and extinguish the fire. In the case of a straw bonnet stove, the effect of the machines was so complete that we will narrate the facts in Mr. James's own words. "A straw bonnet stove is heated by sulphur, consequently at the recent fire, which arose from the overheating of the stove, the fumes were most suffocating, so much so that all my men retired, not being able to bear it, after they had put the machine at the door. I was nearly done myself, but kneeling down and placing my face close to the floor, I managed to raise my arm, and discharge the machine. The moment the vapour began to work out, I pushed opened the door. The sulphur smoke began to rush out, but the vapour from the machine drove it back; I then felt sensible relief, and was able to carry the machine into the room and breathe without any difficulty. I then took in and discharged the second machine, and the fire was instantly suppressed; several people almost im-

mediately entered the room." In the above case great damage was done by water recklessly thrown into the room by the Fire Office engines after the fire had been extinguished. The proprietor complained to the Town Council, who passed a resolution placing the water mains from that time forth under the control of the Fire Brigade Superintendent. In two shop fires, hair-dresser and toy-dealer, woollen and stuff merchants, the superintendent testifies that but for the prompt suppression of the fire by the machines a very great destruction of property would have resulted. In the case of a bookseller's shop, on fire both back and front, two machines discharged, thrust in and left, completely extinguished the fire without the use of a drop of water. In two cases of fire in the same premises—an ironmonger's—the instantaneous suppression of the flames by the machines most probably prevented very disastrous results, as canisters of gunpowder were in both cases found close to the seat of fire.

The Gravesend police have used the machines in three cases—dwelling-house of a coach-builder's, linendraper's shop, and premises of a gingerbeer-maker and fruiterer. In the first case, Mr. Superintendent White and the town surveyor, Mr. Gould, both declare that unless the fire had been so promptly suppressed by the fire-annihilators, nothing could have prevented an immense destruction of property.

The firemen of the Fire Annihilator Company, stationed at Manchester and Liverpool, used machines in four cases; grocer's shop, and upper story of a pawnbroker's at Manchester, and a linendraper's and public bake-house at Liverpool.

The following are the most striking cases of use by inmates—Imperial Patent Wadding Works, Manchester. The fire offices had refused to insure these premises. The manager testifies as follows:—"Owing to the great heat required in the manufacture of our goods, and the consequent liability of the material to ignite, the insurance offices have always refused to insure our premises, even at the rates paid for the most hazardous trades; now, however, we consider ourselves perfectly safe; for, in addition to your apparatus, we have both steam and water conveyed in pipes to all parts of the building, but we consider the annihilator will be able to put out any fire that may hereafter occur. One that took place in January last, was put out in about five minutes by three charges, (although it spread with the rapidity of gunpowder a distance of 150 feet) and the men were enabled to resume work in an hour afterwards. Two other great advantages the annihilator possesses; the vapour enables persons to breathe in the room where the fire is, and the apparatus can be used without causing the least damage to the machinery, as is the case with both steam and water." In two cases, Mr. Hulme's Cotton Waste Mill, Stockport, and Varnish Works of Messrs. Wilkinson, London, the prompt use of the machines no doubt prevented very serious fires. In two cases, buckets of water had been used without effect, but the fire was instantly checked by machines, viz., at the printing house of Messrs. W. and R. Chambers, stack of timber at the Stratford station of the Eastern Counties Railway. In the cases of fire in the drying stove of the floorcloth manufactory of Messrs. Story, Bros., Lancaster (caused by the bursting of the flue), and of fire in the chimney stack at the varnish works of Messrs. Mander, Bros., Wolverhampton (caused by ignition of varnish in process of making), the fire was immediately suppressed by machines. In the case of the cotton-mill of Mr. Riley, Stockport, all efforts to enter the room on fire were baffled by smoke. Machines were used, and the room immediately afterwards entered with ease. Two mills have been saved; the woollen mill of Messrs. Braithwaite and Co., Kendal, Westmoreland, as testified by the following extract from their letter:—"The smoke was so dense that he could not enter the room; and in attempting to do so he nearly lost his life. He then remembered the annihilator, and running to his house (about 300 yards), found his wife had got it ready. On applying it

at the entrance of the room, it cleared it so effectually that he could proceed with perfect ease. The vapour from the machine cleared the smoke and turned the red-hot wood and iron perfectly black. The men were enabled to enter the room with buckets of water, and the fire was quenched. . . . Many intelligent persons, who came the next day to see the room, say they never saw a place saved where the fire had got so great a hold. . . . We owe our preservation, under Providence, to your machine." The flax-mill of Messrs. Andrews and Co., Calne, Wiltshire, as testified by the following extract from their letter:—"The fire broke out in the third or middle story, in the room called the "Tow-room," while the people were at work. The room was filled with tow, and the whole was in a blaze almost immediately, so that the people were driven out without having time to move the strap from the wheel, and stop the machines. The annihilators were brought up and discharged, one after the other. The effect was like magic, the whole blaze being brought down instantly; some water was then thrown on and the fire extinguished. We have no hesitation in stating our belief that if we had not had the annihilators the whole mill and its contents would have been destroyed, for both the rest of the third floor, as well as the floors above, were full of tow; and if the flames had not been extinguished, as they were by the fire-annihilators, the whole would soon have been in a blaze. The woodwork of the machines, as well as of the room, was much burnt." This mill was insured in the Atlas Office. The fact that the mill was saved by the machines, was admitted to the undersigned by the chairman of the Company.

The several cases shortly recited above are published in extenso by the Fire Annihilator Company.

These cases establish the following as the merits of the fire-annihilator:—

- 1st. The power of instantly extinguishing flame.
- 2nd. The power of subduing smoke, so that an entry may immediately be made into a place previously inaccessible.
- 3rd. The ready means of suppression by inmates in cases in which ordinary means are insufficient, and any delay would result in total destruction.
- 4th. Means in aid of engines for Fire Brigade purposes, bringing the fire immediately into manageable compass, and saving wasteful damage by water.

In the face of the above facts, how can Mr. Braidwood justify the omission from his paper of any reference to the Fire Annihilator?

In the face of the facts of use by the Leeds Fire Brigade and Gravesend police, how can Mr. Braidwood justify his neglect of these means in aid of his water engines?

Mr. Braidwood, in his paper, writes—"The main rule to be observed is to get as near the fire with the branch INSIDE the building as possible, so that *the water may strike the burning materials*. If this cannot be done, the probability is that the building which takes fire will be lost." This is an admission that the water engine is not a complete means for suppressing fire. The practice of the Leeds Fire Brigade has demonstrated the value of the Fire Annihilator as an auxiliary power. The means in aid so successfully used by Mr. Superintendent James, of the Leeds Fire Brigade, can surely be turned to good account in the experienced hands of Mr. Superintendent Braidwood of the London Fire Brigade.

In the face of the facts of use by inmates, how can the Fire Offices justify their neglect of an improved means of suppressing fire at the outbreak? This last query leads to the consideration of the second point, viz.:—

2ndly. The suggestion that the Fire Offices are not interested in suppressing fires. This suggestion requires modification, but, modified, presents a truth. The Fire Offices are deeply interested in the suppression of large fires, but it is not their interest (so they consider) to encourage means

for checking fire at the outbreak. The great fire entails heavy losses, but the small fire induces much business. A warehouse fire causes a panic among the offices, but a dwelling-house fire frightens careless people to insure. It is a purely commercial question, and the suggestion noted above must be taken not as an imputation upon the Fire Offices, but simply as the statement of the commercial policy which they consider it to be their interest to pursue.

This question is fully treated in a printed paper, headed, "Reasons why the Fire Offices do not adopt the Fire Annihilator, and why such neglect of an improved means of extinguishing fire is impolitic on the part of the Fire Offices," originally prepared more than a year past for the information of Mr. Masterman, M.P. for the City of London, and a director of the Phoenix Fire Office. This gentleman was so much struck by the observations of a friend who witnessed some experiments with the Fire Annihilator, that he desired to be furnished with information, and expressed his opinion that the Fire Offices were interested in the encouragement of the invention. A conference with his office changed his views. Similar opinions of individual directors of fire offices have undergone, after reference to their offices, similar changes. Individual directors of the Sun, Imperial, Phoenix, and Atlas Fire Offices have purchased fire annihilators for their own protection, but the instrument is ignored by the Sun, Imperial, Phoenix, and Atlas. The fact being as noted above, encouragement of means of check at the outbreak of a fire is considered to be opposed to the commercial interests of the offices, but the view so taken is narrow and impolitic. Encouragement of means of check, and reduction of rates consequent on the lessened risk, would no more work to the injury of the fire offices, than free trade has been found to work to the injury of the farmer.

In conclusion, we beg to adduce the unexpected and remarkable testimony to the practical value of the fire annihilator, given by Mr. Baddeley in his last two Annual Reports, published in the *Mechanics' Magazine*. In the Report of 1855, Mr. Baddeley writes, "Mr. James, Superintendent of the Leeds Fire Brigade, as also Mr. Superintendent White, at Gravesend, have made several very successful applications of the fire-annihilator, showing that when skillfully applied to a legitimate case, the apparatus is not so utterly valueless as it had appeared from the improper uses to which it had been applied, and the exaggerations and misrepresentations by which its pretensions had been supported." In the Report of 1856, Mr. Baddeley writes:—"Another trial of the fire-annihilator took place at Woolwich last year, but, like the former ones at the same place, it proved unsuccessful. It seems to be the singular fate of this invention to fail as an experiment, while it is almost always successful in practice!—a result only to be accounted for upon the supposition that the practical applications are legitimate,—that the experimental trials are not so,—and this is pretty near the truth of the matter."

The above testimony is the more remarkable, as when Mr. Phillips' invention was first brought out it met with no more strenuous opponent than Mr. Baddeley. The opinions quoted are certainly presented in connection with rather adverse matter. We do not think it necessary to enter into an explanation of the occurrences noted or a correction of the misapprehensions put forward. We accept of the valuable testimony as enhanced in value by the depreciatory matter in which it is set. Mr. Baddeley is a convert to facts.

I am, Sir, your very obedient servant,
J. E. B. CURTIS, Secretary.

Lady BENTHAM says, "In justice to the memory of the late Sir Samuel Bentham, I would request you to make known at the adjourned discussion on fire-extinguishing works, that he was the inventor of those so successfully introduced at Hamburg, Liverpool, and other British

towns. His first proposal on the subject was in 1797, when he wrote officially to the Admiralty, and in consequence, these works were erected at Portsmouth, and subsequently at Plymouth; for a description of which I would beg to refer to the 83rd number, Vol. 2, of the *Journal of the Society of Arts*."

Prof. HOSKING, in a note to the Secretary, refers to a little book written by him in 1847, entitled, "Healthy Homes," and to an article in the *Encyclopaedia Britannica*, on "Construction," written in 1854, as containing his views on the subject of Mr. Braidwood's paper. In this article a section is devoted to "Security of Buildings from Fire." The following passage explains how, in Mr. Hosking's opinion, dead heat may lead to the combustion of timber in buildings:—

"It is to be understood, at the same time, that a piece of wood will bear a powerful dead heat upon its sides for an indefinite period without igniting, unless a transverse section of the fibre, as at or around a live knot, or where branch had been lopped, presents itself to the action. It is by the end that a piece of wood, exposed to powerful heat, most readily ignites. The gases evolved in the substance of the timber, by the action of heat applied to its surface, expanding as they are evolved, are thrown out by the pores among the fibres at their ends, if the ends are near enough to the action to allow of this effect, with less power than may be enough to obtain vent for the inflammable gases laterally."

Mr. Hosking adds that, four years ago, he applied much of what he had advocated in respect of security from fire in buildings in a new compartment of Messrs. Clowes' printing office, and that he is now applying the same system, more fully, perhaps, in Messrs. Beren's and Co.'s large stack of buildings in Cannon-street.

Mr. TOLHAUSEN has communicated the following extracts from the *Scientific American*, bearing on the subject under discussion:—

"Mr. E. Konklin, of Cincinnati, suggests the kyanizing of all timber to be used for buildings, so as to render them more fire-proof. He believes that the extra cost of preparing building timber, joists, planks, boards, &c., by kyanizing them would soon be saved in decreased expenses for insurance. The suggestion is a good one. A good fire-proofing solution for timber is, equal parts of alum and sulphate of copper, dissolved in water at the rate of two pounds of these substances to the 40 cubic feet of water."

"Mr. L. V. Bievie, of Akron, Ohio, states, that the best way to prepare fire-proof floors is to cover the plank floor with "Blake's fire-proof paint." "It makes," he says, "a beautiful floor, becomes as hard as marble, and is both fire and water-proof."—March 1, 1856.

"In relation to an article in a late number of the *Scientific American* on fires, allow me to give you a few details about the construction of floors in the houses of Paris which you mention. In this city (New York) all the floors are formed simply by nailing boards on the upper face of the joists and laths on the under part, to hold the ceiling. No provision is made to prevent fire from destroying such floors. When a fire makes an opening through the ceiling, the joists and boards of the floor above are soon burned, and the opening which is thus made causes an increase of the flames by forming a draught. And as the same effect is produced on each floor the whole building soon becomes an immense furnace.

"The floors of French houses are constructed as follows:

"When the joists are fixed in their places, some spikes are driven on each face, at a distance of about two inches from each other, and in a slanting position, at the same time the under part, which forms the ceiling, is covered with lathes. The masons then form between the joists what is called "les auge" (because it has the shape of an "auge" or trough). The spikes and fibres of the timber give a good hold to the plaster, which is also supported by the lathes of the ceiling on which it is pressed and worked down to the said shape leaving only about

three or four inches thickness in the middle and raising against the sides nearly to the top of the joists.

"On the upper face of the joists there is another layer of laths, and on these a coat of old plaster from demolitions, laid on with mortar or plaster, and on this are laid baked hexagonal bricks, which are very generally used. When wooden floors are required some strips of oak are spiked on the coat of plaster above mentioned, so as to take hold in the joists, and on these strips the "parquet" is nailed.

"The timbers of the floors are thus confined between two coats of plaster, and each joist is itself coated with it on its four faces. It is thus that the houses of Paris are secured against fires. No conflagrations like those in New York ever take place in Paris, and when a fire does break out in an apartment, the firemen have only to provide ladders for the windows, through which they can generally soon master the fire—the flames most generally coming out through the windows, having no escape through the floors."—March 15, 1856.

"During the past week, on parts of the successive days a new steam fire-engine was exhibited and operated in the "City Hall Park" of this city, and with gratifying success. The construction of this engine is peculiar—quite different from any other ever brought before the public. The machinery is supported on a four-wheeled truck, made of wrought iron, and resting on elliptic springs, so as to run free and easy. Only one pump is employed—a rotary, of Carey's patent, which is driven by two small oscillating engines of Reed's patent. The rotary pump is placed on the forward end of the carriage, and the two piston rods of the steam cylinders are directly yoked to the central shaft of the pump and immediately behind it. They are set at right angles to one another, working upwards and across the machine, giving the pump a uniform rotary motion. The machinery is thus packed in a very small space, and the pump works without that jarring motion peculiar to those steam fire-engines having fixed steam cylinders and reciprocating pumps.

"The boiler is peculiarly constructed; it is principally composed of a hollow square stack, standing upright, of double tubes having the water enclosed between two heating surfaces, thus exposing a thin sheet of water to a double sheet of fire. Its inventor is Mr. Lee.

"One great object in a steam fire-engine is to get up steam rapidly. From the time the fire was kindled until the steam guage showed a pressure of 80lbs., twelve minutes elapsed when we were present, and the engines then started at a very good speed. At 120lbs., pressure it threw two $1\frac{1}{2}$ inch streams of water $17\frac{1}{4}$ feet horizontally and with perfect uniformity, for nearly an hour. It is intended to light the fire when the engine leaves the house, and thus to have the steam up and ready for work when the engine arrives at a fire."—April 5, 1856.

DISCUSSION.

Mr. FREDERICK BRAITHWAITE said—having for a long time taken an interest in the subject submitted by Mr. Braidwood, he begged to make a few observations on that gentleman's paper, and on the discussion to which it had given rise. He would commence by offering some explanation with regard to the remark made by his brother on the first evening's discussion, viz., that it was not the interest of the insurance companies to extinguish fires. That remark was not thoroughly understood. The observation really made was, that the insurance companies were fearful, if the public became acquainted with the fact that they possessed enormous means of putting out fires, householders would not insure. He had not been prepared to hear the very excellent letter which had been read from the Secretary of the Fire Annihilator Company. He had always considered Mr. Braidwood to be one of the most superior

fire-annihilators of the day, and for the intelligence, energy, and industry he had displayed, the public were indebted to him. He (Mr. Braithwaite) had been professionally engaged by the Fire Annihilator Company, at the time when, by some accident, the premises of the company were burnt down; which gave rise to the remark that the Fire Annihilator Company could not put out their own fire. They would, no doubt, also recollect a facetious article which appeared in *Punch*, relative to an unfortunate accident which occurred to one of the company's machines when tried lately at Drury-lane Theatre, and relative to which a very damaging article appeared in the *Times*. The cause of that accident arose simply from the incautious application of a tube, some 15 feet in length, to the funnel of the machine, which increased the atmospheric pressure beyond what the machine was intended to bear. There was in reality no damage done, but it was sufficient for those who were not favourably disposed towards the invention to condemn it. As well might they say, because an accident occurred to a steam-boiler they were to dispense with steam-engines altogether. He did not go the whole length of the zealous Secretary of the Fire Annihilator Company, who had written the very able letter just read, and he was not so prepared to call it a fire annihilator as a flame extinguisher. It was practically a "steam fire-engine." He could corroborate the letter of the secretary, that by the employment of this machine not only had an immense quantity of property been saved from destruction by fire on land; but on board vessels especially, its value and efficiency had been more particularly tested in saving life. The annihilators were extremely useful as an adjunct to the fire-engines. They ought to go hand in hand. When they heard of the immense amount of property these annihilators had been instrumental in saving, he thought they must feel some surprise that the insurance companies had not yet adopted them. Hundreds of thousands of pounds had been saved to the insurance offices by those fire-annihilators, for which not a shilling had been received from those offices in return, and he therefore thought the subject ought not to be passed over in silence. He hoped Mr. Braidwood would receive it from him as the representative, in some measure, of the Fire Annihilator Company, that their only desire was to assist in the means of arresting fires. He held in his hand a letter which had been received from Mr. Woods, the correspondent of the *Morning Herald* in the Crimea, stating the effects which attended the use of one of those machines in the case of a fire in one of the transport ships in Balaklava Harbour, which he would request the Secretary to read to the meeting. The letter was as follows:—

(COPY.)

SIR.—In reply to your inquiries, I beg to give you the following particulars:—

A fire broke out in Balaklava harbour on the evening of the 23rd January, 1855, on board a screw collier, laden with coals and huts. I was on the *Brude*, transport No. 27, lying next but one to the ship on fire, and witnessed the alarm and confusion which the incident created in the harbour. I saw no flames from the collier, but there was sufficient smoke coming from her to show that the fire, wherever it was, had obtained a hold. Suddenly I heard a slight report—the smoke and confusion ceased—and in a few minutes I was told the fire was completely extinguished. I was informed by Capt. R. Liddle (of the *Brude*), and other captains of transports present, that the ordinary means (water) to extinguish the fire having been tried in vain, a fire-annihilator was brought from another ship and used. Its effect, as far as I could judge from what I witnessed and what was reported to me by others, was so instantaneous as to appear magical. If the fire had not been so extinguished, the disastrous results which must have ensued are almost beyond calculation; for in addition to the crowd of transports in the harbour (none of which could have got out) close to the ship on fire were vessels entirely laden with powder and live shells, and adjoining them, on shore, at the edge of the water, were piles of ammunition (powder and shell) amounting to very many hundreds of tons.

I was informed that a portion of the coal on board the collier was coked, and many of the planks burnt completely through.

You are at liberty to make what use you please of this letter; and I sincerely regret that I am unable to recollect the name of the vessel in which the fire occurred. As, however, both the fire and the complete manner of its extinction were much spoken of at Balaklava at the time, you may, with the assistance of these facts and dates, easily obtain fuller information.

I remain, yours very obediently,

N. A. WOODS,

Late Special Correspondent of the *Morning Herald*
at the Seat of War.

To the Secretary, Fire Annihilator Company.

Mr. Braithwaite added that he tendered thanks to Mr. Braidwood for having brought before the Society of Arts an exceedingly valuable paper—not for preventing fires, but for arresting and controlling them. He hoped, after the unanswerable evidence which had been adduced that evening of the great value of the fire-annihilator, that the Chairman, in his distinguished position as President of the Metropolitan Board of Works, would direct an inquiry to be made as to the real merits of this invention, with a view to the adoption of parochial fire-annihilator brigades.

Mr. THOMAS PIPER said he had listened with great interest to the philosophical essay by Mr. Bridges Adams on the construction of buildings, which was read at the commencement of the evening; but there were several little practical difficulties which had occurred to him as a practical man. With regard to the general suggestion, that arches should be turned in fire-bricks and with fire-clay the result of that would be that the arch itself would be insecure, because the constitution of the clay was such that when dry it would shrink, and leave each brick detached, and so destroy the arch itself. With reference to the glazed lining of flues, a patent had been taken out by Mr. Hiort for the construction of flues in a circular form, which could be built in any direction, the sides of the bricks being glazed. The objection to this plan was, that the glazing did not hold the soot, and at every shower of rain the drops came down the chimney with their load of soot and dirt, producing thereby great inconvenience and annoyance. He thought the object of the discussion was not so much to theorise on what they might do if they had the requisite materials, as to look at the buildings they did construct, and see how they could render them less liable to the objections which had been made against them. He would first speak to the observations of Professor Hosking, who suggested that the evolution of gases caused timber more readily to ignite at its end. He (Mr. Piper) believed it would be found, that when timber was heated to a point to become ignited, the great matter to support combustion was pure air, to supply the necessary oxygen; whilst, if they covered the inflammable material with a thin coating of plaster, it would be seen how the stoppage of the access of oxygen rendered the material incombustible. A perfect plaster ceiling, in the ordinary way, was a good stopper of fire. In a house of his own, in which the ground floor was burnt, the floor above the room in which the fire originated was uninjured, in consequence of the resistance which the fire experienced from the plaster ceiling; and if the ceilings were constructed in this country as they were in France, and as he had constructed them, under the instructions of Professor Hosking, they would be still more resistant of fire. Instead of covering the bottoms of the joists with thin lathing, and then putting on a ceiling pushed up from below, in France a movable frame of wood was placed under the ceiling; on this two inches or more of plaster was put on and thrust through from the top; thus an incombustible surface was prepared, which would resist fire. As houses were generally constructed, the spaces between the floors and the joists, and the quarterings of the partitions formed so many flues from top to bottom, and greatly promoted the progress of fire. The flames, on catching the floor, passed through these flues so prepared for them, thence to the skirting, and thus communicated with every part of the

house. The practical observation he would make was, that it was desirable to avoid lath and plaster partitions in houses, and also that the ceilings should be thicker and stronger than was the case at present. He believed that the disuse of wood skirting, in accordance with the views of his late friend Mr. Cubitt, would go far to prevent the destruction of houses by fire. The use of plaster for the decoration of doors, &c., would also do much to prevent the spread of fire, and by the improvements in making plaster, by the introduction of Martin and Keene's cement, the building might be made more fire-proof than was ordinarily the case. He had extensively used the method of flooring introduced by Messrs. Fox and Barrett. It consisted of wrought-iron joists, I-shaped. Upon the lower flange were laid laths, and upon these laths concrete was placed, forming the floor. But he found this to result—when the concrete was all loose, each joist appeared to be isolated, but when the mortar became set and indurated, the whole then formed a perfect landing, and if it moved at all it moved together. He had seen these floors adopted to a large extent, and he believed it to be a most valuable invention. With regard to cost, which in this practical age was a most important one, any house could be constructed with this description of floors with the additional expense only of the flooring boards, that is, the cost would be enhanced by the amount of the value of the flooring boards only. Advertising to the communication of Mr. Bridges Adams, not only had Fox and Barrett's floors been extensively used, but the suggestion of Mr. Adams, of flat roofs covered with tiles, so as to form a terrace, had also been employed. But the point was this, when they had to contend with a large body of fire, it was found that cast-iron yielded, and wrought-iron was twisted by the intense heat to which they were subjected. If a building were constructed in the manner suggested by their philosophic friend Mr. Adams, he doubted whether, under the amount of fire with which Mr. Braidwood was familiar, such a building would stand. The point, however, was not so much to attempt to govern a fire when it had got hold, as to give it so little food as to be managed in the apartment in which it originated, and prevent it from spreading. He believed that, by a very simple process, staircases might be rendered less combustible—that was by constructing them as they did in France, filling in the spandrels with incombustible material, instead of constructing them as so many hollow boxes. If the stairs were a solid mass, it would be a long time before the fire would act upon them in such a manner as to render them impassable. He would add one word with regard to the fire-annihilator. Mr. Braidwood had stated that an early and well-directed application of water to the spot immediately on fire was of great importance, and that if the water did not reach the spot on fire, it was useless towards extinguishing the flames; but the vapour from these machines would fill the whole apartment, and to that extent he thought there would be great benefit from their use.

Mr. BADDELEY desired to offer a few words in explanation of some of the remarks which were made at the previous meeting, either in Mr. Braidwood's paper or in the subsequent discussion. Before doing so, however, he wished to state that as, in his opinion, the statistics of fires furnished a most instructive lesson in the way of precaution, and suggested the best methods of prevention, he had prepared some tables illustrative of these matters, which he begged to present to the Society. On reference to the causes of fires, it would be seen that the five classes into which Mr. Braidwood had divided them included four-fifths of all the known causes of fire in the metropolis during the last twenty-three years. Carelessness in the use of fire and artificial light, and in the construction of buildings, occasioned a fearful number of accidents. At the same time, fires would sometimes occur in the most carefully-conducted establishments, from accidents wholly unforeseen, and, for the most part, unavoidable, and in spite of the utmost precaution. A remarkable

illustration of this fact took place in December, 1853, in New York, at the premises of Messrs. Harper, printers, booksellers, and stationers. This firm, having suffered severely by fire on a previous occasion, was particularly careful, in rebuilding their premises, to take every possible precaution for the prevention of the recurrence of so dire a calamity. They had a steam-boiler in the basement, but, with this exception, no fire whatever was permitted in the building. The gas-lights were most carefully arranged; the building was warmed by steam-pipes; and the charcoal fires usually employed for heating the bookbinders' tools were replaced by gas jets. Constant care and watchfulness was the rule of the establishment, and a fire could hardly have happened, but for one of those unfortunate accidents which render unavailing all human foresight. Camphine was necessary for cleaning the inking-rollers, but this operation was conducted in a room fitted up expressly for that purpose, and lined with zinc. Some repairs being required, a plumber had occasion to light a lamp, which done, he very carefully threw the match into what he took for a tray of water, but which unfortunately was camphine. The place was instantly in flames, and the whole of the premises, with their contents, valued at upwards of one million of dollars, were entirely destroyed. Spontaneous ignition would be seen to have occasioned upwards of three hundred fires in the period under review, being nearly twenty per annum. Although the fact of spontaneous combustion taking place in cotton, wool, hemp, lamp-black, and many terrified vegetable substances, was tolerably well known at the close of the last century, we were still very much in the dark as to the peculiar laws by which these phenomena were regulated. Mr. Braidwood had stated "that there appears to be some chemical action between heated iron and timber, by which fire is generated at a much lower temperature than is necessary to ignite timber under ordinary circumstances." This fact was indisputable, but no satisfactory explanation of it had yet been given. The iron (chemically speaking) was by no means essential to the result, because it had been repeatedly observed that roasted bran, coffee, malt, and other vegetable substances, as well as coke, charcoal, and other matters, after being cooled down to such an extent as to be easily handled, had, when laid together in bulk, gradually increased in temperature, until they had eventually ignited. To this phenomena he had given the name of the accumulative property of heat, but could offer no satisfactory explanation of its cause. Mr. Marable, at the last meeting, supposed that the timber was converted into "touch-wood" previous to ignition, but such was not the fact. The timber assimilated more to the character of charcoal, and ignition took place in these cases at a temperature much below the igniting point of either touch-wood or charcoal under ordinary circumstances. The greatest cause of fire was candles, upwards of four thousand fires having been thus occasioned in London since 1832. But this might have been expected, seeing that candles were almost in universal employment. The next prolific cause of fire was flues, then gas, and under these three heads alone more than half the total number of fires would be found. "The best means of arresting fire" was, as Mr. Braidwood most justly observed, "a very wide question." He begged to differ, however, from Mr. Braidwood, when he stated that, "the only limit to the means is the expense," because he had for years past held the opinion that the best means of arresting fire would be the least expensive. He apprehended there could be little doubt but that with constant water service under pressure, with suitable arrangements for its prompt and efficient application, not only would the loss of life and property by fire be greatly diminished, but the early extinction of fires would be effected at a greatly reduced expense. Such had been the result of the adoption of this principle in Philadelphia, Hamburgh, Liverpool, Manchester, and other places, and such must be the results in London eventually. The present arrangements of the water supply in the metro-

polis were not yet such as to permit the direct jet from the water mains to be entirely depended upon for extinguishing fires. At the same time these jets were much more available than was generally supposed. They were extensively used at the finish of large fires (as stated by Mr. Braidwood), and might with great advantage be still more extensively employed at the beginning of small ones. It was a very common occurrence for the firemen to find a fire burning in a cellar, or it might be in a shop, the whole of the fire being below or within ten feet of the ground. In such cases a plug was opened, capable of giving a twenty, or even a thirty feet jet, which was abundantly sufficient for the extinction of such a fire. Nevertheless, the engine was set to work, and in a few minutes the fire was put out. In some experiments that were tried on the Southwark mains and services some time back, seven-eighths inch jets from the service pipes were thrown to a height of 30 and 40 feet, and jets from the mains to 50 and 60 feet. In many parts of the New River and East London districts, similar jets had been obtained. He congratulated Mr. Braidwood on the change which a lengthened experience had produced on his mind, as to the efficacy of small machines for extinguishing fire. He had, on many occasions, himself extinguished considerable fires, and had seen other persons do the same, with apparatus almost ridiculously small. Mr. John Braithwaite had given the result of his experience with small extinguishing engines, and he (Mr. Baddeley) considered that the adoption of the hand pump (or syringe) by the firemen, was one of the most valuable improvements ever introduced since the formation of the present establishment. He had little doubt but that when the firemen gained more confidence in the capabilities of these machines, increased good would arise, and that by means of the hand-pump, or, if the occasion were more serious, of the direct jet from the main, the engines would be in much less request, thus effecting a great saving both in time and money, and reducing the damage done by water to a minimum. The true theory and practice of fire extinction, consisted in covering the largest possible surface with any given quantity of water. With this object in view he had invented the jet-spreader, a great number of which were now in use. They had been found extremely advantageous, especially at agricultural fires. Mr. Braidwood had alluded to the different modes of extinguishing fires which prevailed in different countries, and in different parts of this country, but was not disposed to venture an opinion as to which was the best. The arrangements for this purpose, in London, were peculiar. The legal provisions had now become almost obsolete, and had been to a very great extent superseded by two voluntary associations, having, as Mr. Braidwood truly observed, "no legal authority of any sort." The protection of life from fire was undertaken by a society whose affairs were conducted by a committee of management, and supported by the voluntary subscriptions of the public. The suppression of fire was undertaken by another society, whose affairs were also conducted by a committee of management, supported by the voluntary contributions of a portion of the existing insurance companies. In addition to these we had the parochial engines, of which it was the fashion to speak in the most contemptuous terms. The inefficiency of a large majority of parochial fire establishments had certainly been such as to justify the severest remarks of "Boz" and other writers. When parish engines were first instituted, they were almost the only means of protection against fire then existing; but the increased provision of firemen and engines by the insurance companies, rendered the parish engines of less importance, and the niggardly and inadequate sum devoted to their maintenance and application, greatly marred their utility. The practice of cutting down the Parliamentary fire rewards, by parsimonious church-wardens, or in some parishes repudiating fire-rewards altogether, had worked much mischief. In the populous suburban districts of Kilburn, Kentish-town, Islington, Hackney, Stratford,

Deptford, Peckham, Clapham, and many other places the distance of the nearest Brigade engine-station rendered them entirely dependent upon local means for arresting the spread of fires, and where this matter was conducted upon a liberal footing, the parish engine was still found to be a really "noble institution;" and well deserving of public support and encouragement. Mr. Hows expressed some regret, on the former occasion, that no mention of fire-escapes occurred in Mr. Braidwood's paper. Considering the great amount of accumulated experience from which Mr. Braidwood had to select and condense matter for such a paper as could be conveniently read at a meeting, it was too much to expect any notice of what was really a different branch of the service to that in which Mr. Braidwood was engaged. The Protection of Life from Fire was, however, a topic of great importance, and if agreeable to this Society, he should be most happy to prepare a paper upon that subject. With reference to the communication of Mr. Curtis as to the fire-annihilator, Mr. Baddeley begged to observe that the hostility therein laid to his charge was not against the annihilator itself, but against the exaggerated claims and misrepresentations put forward by the inventor. Mr. Phillips proved himself to be a most unskillful fireman, and all his experiments were of a most fallacious character; where no trickery could be resorted to (as at Woolwich), signal failure was the result. Mr. Braithwaite had admitted that the true character of the annihilator was at first misunderstood, and its powers greatly overrated, being brought forward as a substitute for, instead of an auxiliary to, the ordinary means of extinguishing fires. While the experimental demonstrations made by the inventor had been far from satisfactory, the skilful and judicious use of the annihilator by practical men had been attended with the best success, both as a fire extinguisher and as a pioneer to the fire-engines. In these cases its value and importance had been manifest. He would conclude by expressing a hope that Mr. Braidwood might long be spared to preside over the establishment which he had now, for twenty-three years, so efficiently conducted.

Mr. ROBERT RAWLINSON, C.E., remarked, that Mr. Braidwood had said, "The Water Companies are generally willing to give any quantity of water, but they object to lay down large mains without any prospect of remuneration;" and further, that "plugs" were generally on small branches, and not on the mains, so that any available head was lost, or destroyed, by friction. The practice of using water from the mains direct in Manchester was noticed, but was not considered applicable to the metropolis. Mr. Rawlinson stated, that what could be done in a small town could be done more economically in a larger one; and after all, improvements to be useful, must be economical. He felt satisfied that the water supply in London could be made as active as in Manchester or as in any lesser town. The question of extinction of fires was most important. It was one which, sooner or later, must engage the attention of the local governing bodies of the metropolis—and must involve an improved system of water supply. It appeared there was a dormant pressure of some 150 feet—that is—150 feet head; but, by reason of friction and exhaustion, there was little or no active head. Water under the present system would not rise from the mains more than a few feet. It was a question well deserving consideration, as to whether some means could not be adopted to make the present mains answer the purposes required. "Head," or pressure, was lost by length of main, by bends, and by any obstruction causing friction. A length of parallel main might have 150 feet head at one end, and might only have a few feet of working or active pressure for fire purposes at the other end. By the erection of what he would call towers or reservoirs of equilibrium, a more even, regular, and effective pressure might be established. The capacities of pipes varied as the squares of their diameters, and their delivery about as the square root of the head, minus friction. Water would, under the

most favourable circumstances, rise through the atmosphere in a jet to a height of about two-thirds the head; that is, from 135 feet head, a jet should rise 90 feet. Friction would reduce this. Mr. Beardmore, in his valuable hydraulic tables, detailed experiments with pipes under several conditions as to diameter, length of main, and head, giving the height of jet and volume of water discharged.

IN PRESTON,

From 6-inch main, head 110 feet.

Height. Discharge.

With 1 jet $\frac{3}{4}$ inch	57	feet	12·5	cubic feet
" 1 "	64	"	14·4	"

The first being during the day, the latter during the night.

IN LANCASTER.

From 8-inch main, head 225 feet.

With 1 jet an inch in diameter, the water rose to a height of 140 feet.

With 100 feet of common hose of 3-inch diameter, the water rose to a height of 80 feet.

Before water could be available under pressure, there must be proper fire-cocks or hydrants. He spoke under correction, when he said that fire-cocks were unknown in the metropolis. A rude wooden plug was driven into an open pipe end, and when water was required for use at a fire one or more of these must be drawn and the stand-pipe must be inserted in the face of the rising stream. Now fire-cocks could be put on the mains, and were in use in all towns where new works were established, which would perfectly command the water. A wine glass might be filled or a jet might be thrown over the adjoining houses. Proper hydrants or fire-cocks might be used for purposes of street-watering. They would be placed at short distances apart, and a water cart, with stand pipe, key, and hose, could fill 250 gallons in $1\frac{1}{2}$ minute of time; at present, carts for street watering all over the metropolis, were filled at pumps; man, horse, and cart, were delayed a quarter of an hour or twenty minutes to fill a cart, and then the same cart had to travel the same ground several times over, full and empty. With hydrants a cart would be immediately filled at any point, and would never traverse useless ground, one cart under improved arrangements doing the work of three as at present, and at one-third the cost. Water in force, was more effective at a fire than where it was merely poured out over it; now force implied volume, and one jet from a street-main might have the force and volume of several hand-engines. The best fire-engines did not throw water more than 95 feet high, and this, in spray. A jet, could be made to rise from one to two hundred feet and upwards. At some of the great cotton fires at Liverpool, it was only the force which knocked the fire out, and not the wetting of the materials. Force and volume of water might be obtained in the metropolis by a proper revision and improvement of the water mains and services.

Mr. BARRETT observed, that Mr. Braidwood had stated in his paper that *carefulness* was one of the best preservatives against fire, and no doubt he was right. He feared, however, that so long as we continued to construct the interiors of our houses of a material so inflammable as timber, so long should we have to regret the annual loss of a vast amount of property, and to deplore the still greater evil of a large destruction of human life. It was remarkable that with so subtle and insidious an enemy as fire to deal with, we should still continue to provide, in the construction of our buildings, that description of *food* which was best adapted to that enemy's devouring propensities. But so it was; we were wedded to custom, and it was exceedingly difficult to break through long-established habits. The construction of fire-proof buildings was a subject that had certainly not received that degree of attention which its importance merited. Until within a comparatively recent period, very little had been attempted in that way. Some few of our more important public buildings, some of the mansions of the nobility, occasionally a warehouse, and here and there a cotton,

clothing, or silk mill, had been constructed upon a fire-proof principle, namely, that known as the iron girder and brick arch system; but this system was not adapted for domestic buildings, nor was it altogether free from objections. It had been well said that the arch *never sleeps*, it was always exerting a strain upon its supports, which required to be counteracted, and although it was customary to use tie or tension rods for the purpose of resisting this lateral strain, these rods were not always employed, nor when employed were they always successful, and occasionally accidents of a most serious nature had occurred in buildings constructed upon this plan. He could instance many of these, but would refer to only one, that of a large mill in the North of England, consisting of five stories. One of the arches in the upper floor of this building had settled, or sunk, and it became necessary to re-construct it. In doing this, sufficient care had not been taken to strut or keep apart the girders upon which the arch was supported. They, in consequence, yielded to the lateral pressure of the adjoining arches, and the whole range of girders and arches gave way, and fell to the floor below. This floor also yielded to the mass of materials thus suddenly thrown upon it, and so on, in succession, every floor gave way, the entire building becoming almost instantaneously a mass of ruins, and killing 20 persons in its fall. This method of construction could not, therefore, be looked upon as free from objection, nor was it generally applicable. What was really wanted, he apprehended to be this—a method of construction that for all ordinary purposes should be practically fire-proof; one that should combine great *simplicity* of construction with *economy*, so as not to exceed, in any great degree, the cost of a building as generally constructed; and one that should at the same time be applicable to all descriptions of buildings, particularly to those of a domestic character. The system of fire-proof construction, which he had been for many years engaged in carrying out, he believed fulfilled all these conditions or requirements. He would, not, however, trouble the meeting with a particular description of the system, Mr. Piper having already been kind enough briefly to describe it. He would merely observe that by the combination of wrought iron joists and concrete, the floor of each room became in effect a beam of artificial stone, with ribs of iron, the structure possessing great strength and rigidity by the consolidation of these materials. The underside was ceiled much in the ordinary manner, and the upper surface adapted to receive the ordinary flooring boards, or such other finished surface as might be required. Mr. Braidwood had referred to a description of building with which there was confessedly some difficulty in dealing, namely, the large Manchester warehouses, and buildings of that class; but these were the exceptions to the rule—they were the units in the hundreds, even if they bore so large a proportion; and being exceptional cases, they required to be dealt with in an exceptional manner, and arrangements which would be quite unnecessary in buildings of an ordinary character might be adopted with great propriety in these. He thought that in all cases the roofs of such buildings should be constructed of solid incombustible materials, and that there should be as few openings in it, for skylights or other purposes, as possible,—such as were absolutely necessary being, in all cases, double-glazed. A roof so constructed might readily be formed into a tank containing a large supply of water (a plan which had indeed been carried out upon this system some years ago), or cisterns might be formed, as Mr. Adams had suggested in the communication he had made to the meeting. From the reservoir of water thus obtained pipes could be brought down in the corners of the rooms, or most convenient situations, these pipes being furnished with stop-cocks or valves at the level of each floor, where a hose might be permanently attached, affording a supply of water at all times, which by merely turning a cock could be thrown in any direction in the event of fire. If in addition to these precautions, the

floors of the building, instead of being constructed of timber, as was generally the case, were formed of incombustible materials, ten or twelve inches thick, he thought there would be little to apprehend in case of fire. It should be remembered that fire itself generated an atmosphere which would not support combustion. A fire would burn but slowly till it had succeeded in burning a hole in the floor, when getting a ready supply of air, and meeting in the floor itself with the requisite fuel, it would extend with great rapidity. But the case was very different when the supply both of air and fuel was cut off, which would be the case with floors such as he had referred to. He had observed, in several instances, in the case of buildings constructed upon his system, where fires of coal and coke *laid upon the surface of the concrete*, had been kept up for weeks together, for the purpose of drying the plastering of the walls, that the difficulty always was, not to put the fire out, but to keep it in, the attendant being constantly employed in going round the building, and stirring up the fires, to prevent their going out. Although in buildings with very large areas without vertical divisions, it might not be possible under all circumstances to prevent serious damage being done, he thought the evil might be very much mitigated; for he felt convinced that in those cases referred to by Mr. Braidwood, where so intense a degree of heat had been generated as even to fuse cast-iron, it had arisen from the fact of the materials of which the building was composed themselves affording the fuel necessary to produce that degree of heat.

Mr. WINKWORTH said, that as the fire-annihilator had been alluded to, he would beg to call attention to the following extract from Dossie's *Memoirs of Agriculture* (vol. I., p. 316 *et seq.*), published in 1768. It should be stated that in these *Memoirs* the early transactions of this Society were recorded. The incident narrated in the extract occurred in the year 1761, as shown by the Society's minutes:—

"There was another important object of the Society's pursuit, of which they sought the attainment of the end, without regard to any premium or bounty. This was the procuring to the public the benefit of a method of extinguishing accidental fires in houses. There had, at the time this matter was started, lately been an uncommon number of such accidents; and a member of the Society, since dead, who had great zeal to do service to the public, had met with a pamphlet treating of a method of extinguishing fires. Finding it had been proved by experiments publicly made to be effectual, not only in the beginning of fires, but even when they have made some progress, he thought it might be rendered advantageous to the public by being made known through the means of the Society. The extinction of the fires was performed by the use of balls charged with explosive matter, and a fluid that has the property of damping fire, and provided with a match to fire the contents. These balls were to be thrown into the room on fire, and bursting there, produced the effect by their explosion and the action of the damping fluid, which was dispersed by the explosion over the whole surface of the room, and quenched the heat. The pamphlet had been published by Mr. Godfrey, an eminent chemist, who introduced this method here, and had obtained a patent for the sale of the balls. The Society had these facts laid before them, and the pamphlet was produced and read to them, by which, as the method proposed appeared of very great consequence, and, from good authority, to be efficacious, they were determined to use their endeavours to bring it into practice. They were further informed that the grandson of Mr. Godfrey, who had succeeded in his business, was master of the knowledge of preparing these balls, and even had some of them in his possession. On this intelligence, they formed a design of having the experiments tried before the public at large, and applied to Mr. Godfrey for his concurrence and assistance. He consented to furnish, at his own expense, the balls that should be wanted, and to attend and conduct the management of them. It was then resolved to build a proper edifice, at the Society's expense, three stories high, near some extremity of the town, which being set on fire, might give a full opportunity of observing the effects of the operation of the balls. This was accordingly done at a little distance from the end of Tichfield-street, near Marybone; and the building being finished, a

quantity of wood, faggots, and shavings were put into the rooms of the ground-floor and first-floor. Fire was then set to the combustibles in both rooms at the same time, and when they had taken hold of the wainscot the balls were thrown in, and had immediately their due effect. A part of the spectators, the whole being very numerous, who were not near the building, and, consequently, did not perceive how much the fire had gained upon it before the balls were thrown in, expressed some dissatisfaction and doubt whether the trial was fair or sufficient, on which, it was resolved to repeat it in the uppermost room. This second time the fire was suffered to prevail in such manner, not only on the combustibles put into the room, which were in a copious quantity, but on the wood of the building itself, that the flame came strongly out of the chimney, and forced its way with great violence out of the windows. But, instantly on the explosion of one ball thrown in it, entirely disappeared; and on that of a second, not a spark of fire was found unextinguished by the spectators, who immediately went into the room. The flooring was burnt through, and the wainscot reduced to coal in many parts. This removed every surmise of doubt of the efficacy of the operation, and the Society confirmed afterwards the resolution the committee then passed, 'that the experiment had answered to the full satisfaction of everybody.' There can be no question made, but that this method will extinguish fires in the beginning, and in many cases, even after they have burnt some time. The only difficulty is how to procure the balls at the times they are wanted. The Society intended by this public demonstration of their efficacy, to induce at least such as are particularly liable to accidents of fire to provide themselves with them, as there are many cases in which they might have been used with success. But notwithstanding what they have done, and Mr. Godfrey's advertising the balls after this trial, very few have taken them. But when fires happened at that time the populace called on Mr. Godfrey to attend with them himself. But, as fires are casualties that do not threaten particulars enough to strike the multitude with a strong sense of apprehension, by degrees the whole of this exhibition of a remedy seems forgot. The Society, however, have shown to the public that there is an easy method by which fires may be extinguished in many circumstances though not in all, and it is to be regretted that their generous endeavours for the public safety are not seconded by some provisions being made for the application of this method on the proper occasions. If the balls were kept in some proper places in each parish, as engines and buckets are, where recourse could be quickly had to them on any emergency, they might certainly be rendered preventive of some of those fires that are extremely calamitous and now so frequent."

Mr. SAMUEL GALE requested permission to read a notice of a somewhat similar experiment to that brought forward by Mr. Winkworth, which appeared in the *London Journal* for Saturday, December 15, 1722. It was as follows:—

"From Paris we have an account that on the 10th inst., an experiment for extinguishing of fire by a machine, invented by a German, was tried in the Court of Invalides there, in presence of the Cardinal du Bois, M. Le Blanc, Secretary at War, and several of the nobility. One of the barracks was filled with faggots and other combustible materials, and set to fire. When it was all in flames, M. Le Blanc ordered the German to extinguish them. The machine was a vessel fixed upon a small wheel carriage, and contained about half a hogshead of water. In the middle of it was a kind of granado, with a match fixed to it by the bunghole of the vessel. The match being lighted he withdrew, and immediately the granado and vessel burst, extinguishing the flames, although they mounted to a considerable height above the barrack. The German and his people then entered the barrack, and entirely put out the remainder of the fire with a few buckets of water. The experiment gave thorough satisfaction to the spectators. The only difficulty which seems to attend the operation is, how to get the machine in time to the upper floors of houses."

Mr. Gale then alluded to the statement made by Mr. Braidwood, that a chemical action went on between hot-water pipes and timber, tending to produce fire at a lower temperature than ordinary, and that on that account hot-water pipes should not be fixed within three inches of wood. An experience of more than thirty years taught him that this was not the fact. As proof, in some degree, on this point, he produced a small piece of wood, cut that morning from a floor board, which had been in contact

with a hot-water pipe in constant use for eighteen years. Further, he had carefully examined one of the largest hot-water apparatuses in London, where the pressure was at least forty feet, and here he did not find any signs of chemical action or charring of the wood near the pipes; indeed, the wood bearers, on which many of the pipes rested, were as fresh and free from defect as when first put in. He believed that there was no means for producing artificial warmth so free from danger as low-pressure hot-water apparatus. It was important that this should be understood, for, by a clause in a recent Act of Parliament, the fixing of hot-water pipes within the distance described by Mr. Braidwood, had been prohibited, thus preventing the use of one of the greatest means of comfort, unless at a great outlay, or in houses specially constructed for the purpose, and interfering with a very important branch of business.

The CHAIRMAN said he was confident he should only express the sentiments of the meeting by moving a vote of thanks to Mr. Braidwood for the valuable paper he had laid before the Society. That paper had led to a discussion upon many very important points, and he trusted that the result of that discussion might be an improvement in the means of annihilating fires. It could not, he apprehended, be doubted but that a strong impression must have seized the mind of every practical man present as to whether the organisation of the Fire Brigade was one that was either satisfactory to the public or safe to the community at large. No doubt the insurance societies, who bore exclusively the cost and charge of this establishment, had a direct interest in sustaining that establishment in the most efficient manner. He was ready to confess that the statement which had been made in the course of the discussion—that the insurance companies had an interest in property being destroyed by fire—had had no effect whatever on his mind, believing, as he did, that the insurance companies must evidently have a direct interest in putting out every fire which might be ignited within the metropolis. The very fact of keeping up an establishment at so serious a cost to the companies themselves, must be sufficient proof that they had an interest—a commercial interest—in extinguishing fires as speedily as possible. But how far the present system was one that ought to remain satisfactory to the metropolitan public was a question in his mind anything but settled. It was not for him—especially in the peculiar position which he had the honour to hold—to indicate that kind of organisation which should supersede or act as an auxiliary to that which was already in operation; but for that metropolitan public, who were so largely taxed by government upon an act of the first prudence—viz. the insurance of their property. He could not but feel that the metropolitan public, so taxed, had a right to ask from the government some protection to their lives and property in return. And, at the same time, he could not admit that the insurance companies had no interest, or should not be called upon, to contribute towards an establishment that would so protect the lives and the property of the metropolitan public. How that arrangement was to be made, and what should be the future management, was a question which he could not venture to indicate; but that some more extensive organisation must be established, must be apparent to all who had listened to the discussion. They had, in their friend Mr. Braidwood, that which inspired confidence; wherever his presence was seen, they had the security of property. He had always admired the operations of the Fire Brigade; for wherever they took possession of premises under the influence of fire, the property then liable to be destroyed, so much of it as it had been possible to save, had been perfectly safe in their keeping. Moreover, the Brigade exercised the most diligent and anxious care for the lives of the inmates and the protection of the public at large; and the rules—the very stringent rules which Mr. Braidwood had introduced into his establishment—were as creditable to him as they were beneficial to the public

He trusted that the issue of the discussion might be that the system of protection to the public might be increased; and he was sure nothing had given him more pleasure than to listen to the very practical paper which had been laid before them, and to the discussion which had followed. He hoped that Mr. Braidwood's life would long be spared to the metropolitan public, who already owed him so deep a debt of gratitude. He (the Chairman) had therefore great pleasure in proposing that their thanks be tendered most cordially to their friend Mr. Braidwood for his valuable and highly interesting paper; and he trusted that the result of it might be more than even the most sanguine anticipations could have depicted to his own mind.

Mr. BRAIDWOOD said he was very much gratified by the handsome manner in which the vote of thanks to him had been proposed, and he accepted it with pleasure. At that hour of the evening he would only slightly advert to one or two matters introduced in the discussion of the previous evening. Most of the speeches on that occasion, he thought, answered each other, but there were, nevertheless, one or two points for notice. In the first place, he would remark that the paper itself was very far from being a full and explicit explanation of all that might be said on the subject of fires. If he had attempted such a thing it would have been unsuited to this or any similar society. He had endeavoured to make the paper as interesting and as useful as he could in the limits to which he was restricted. Mr. John Braithwaite had expressed an opinion that the insurance offices were not anxious that fires should be extinguished. The brother of that gentleman had, however, in some degree, qualified that remark. During the last 30 years no fewer than 136 insurance offices had been in existence, but there were not now more than 70 doing business in the three kingdoms, or, in other words, nearly half the number had been unable to obtain premiums enough to pay their losses and ordinary expenses. It could hardly be supposed that if one-half of the offices were broken up from such a cause, the other half would be anxious to increase their losses from fire, and, therefore, if they could reduce the number and extent of fires they would do so to the utmost of their power. He knew, from constant communication with the fire offices, that they were very anxious to get fires extinguished, and were ready to do everything in their power to accomplish it, consistent with the due consideration of their own interests in point of expense. He could also state that the subject of steam fire-engines had been seriously considered; but if the fire-offices were disposed to incur the cost which six or eight of these engines would involve, there was not at the present time an adequate supply of water from the mains to work any number of them at a fire. There was scarcely a sufficient supply for ten or twelve of the engines ordinarily in use. Therefore, steam fire-engines—admitting their great efficiency—were out of the question, until a larger supply of water could be obtained. If he might compare small matters with great, he would liken the steam-engines to a battering train—most efficient when well placed and served, but slow of movement, and requiring large supplies. The common fire-engine, well constructed, and not too heavy, might be likened to field artillery, which, from its power, but especially from the rapidity of its movement, was invaluable. To carry out the simile, hand-pumps might be supposed to take the place of musketry, which might be used when and where it was desired—from a wash-hand basin, if necessary. With regard to the supply of water, his impression was that when they came to have an adequate supply for steam fire engines, a higher pressure would also be given, so that they could work from the main, without requiring the steam fire-engine. Mr. Hawes had asked the question, how were houses to be heated? He (Mr. Braidwood) had stated that he considered open fire-places were the safest, if the hearth was not laid upon timber, which might easily be ascertained. Mr. Papworth had stated that stone staircases cracked at the wall;

but that arose generally from cold water coming suddenly in contact with the stones when much heated, and thus fracturing them; but if a house were built with brick partitions and solid floors, there was little probability of a stone staircase becoming disabled from such a cause in an ordinary house. Mr. Papworth had recommended platting of iron; but he (Mr. Braidwood) had never found it succeed. In a fire at the Bank of England, the hearth on which the stove was placed was cast-iron an inch thick, with $2\frac{1}{2}$ inches of concrete underneath it; but the timber below that was fired. In the case of a fire in a timber building, used as a wadding manufactory, the timber most injured was where it had been covered with sheet iron, which did not allow the water to reach it until the nails were burned out and the iron fell. Mr. Papworth had also alluded to the authority given in Paris to break open the doors of houses on fire; here it was one of the most arduous tasks of the police to keep them shut till the means for extinguishing the fires were ready; necessity was the only excuse for breaking open a door here without a magistrate's warrant, and it seemed a very salutary restraint to prevent useless damage. He remembered but one prosecution against the Fire Brigade for breaking open a door, but the necessity being proved by the neighbours, the firemen were exonerated. There were several continental laws as to fires that would not suit here. In France the people were compelled to work the engines without pay, here they were paid 1s. for the first, and 6d. for each succeeding hour. A great deal had been said about insurance in France. There was a curious law in the Code Napoleon, which enacted that if A, B, and C lived in adjoining houses, if B's house took fire, and A and C were damaged thereby, B must pay the damage as well as bear his own loss, unless he could show that there was no carelessness on his part, that was, prove a negative; but to get rid of this, B insured his own house for 10d. per cent., and each of his neighbours for 5d., they, of course, both paid 5d. for him, which made 1s. 8d. per cent. on each house; this, with the average clause, made a common insurance about twice as expensive as it was here. This also caused the amount insured in France to appear very large, great part of the property being covered three times over. With regard to parish engines, he might mention that in Hackney, there were five good engines provided with horses, and a staff of six or eight men to work them. This had been done out of the parish funds, whilst another parish, which might be presumed to be equally as wealthy as Hackney, were endeavouring to effect the same object by subscriptions, although they had the same right to pay the expenses from the parish funds as the inhabitants of Hackney had. Mr. Rawlinson had mentioned the matter of fire plugs. He (Mr. Braidwood) apprehended that was not a matter with which the water companies had to do. It was the business of the parishes to put proper plugs on the mains. There were as many as 40,000 or 50,000 plugs in London; and he apprehended to fix the fire-cocks alluded to by Mr. Rawlinson, would cost about £5 a piece.

Mr. RAWLINSON said, fire-cocks might be purchased for 20s. each, and be fixed for 7s., 10s., or 20s. each in addition. The cheapest fire-cocks cost, fixed, not more than £2; the most expensive cost, fixed, not more than £3 10s. The cheapest were ball-valves; the dearest, screw-valves of brass, with brass fittings complete. The estimate for fitting up the metropolis with proper fire-cocks would therefore be, taking the larger number, 50,000, mentioned by Mr. Braidwood, £100,000 in the one case, and £175,000 in the other. These sums, he considered, were no great matter for so important an improvement to the whole metropolis.

Mr. BRAIDWOOD stated, that these fire-cocks were in use at the Exhibition of 1851, and that considerable damage was caused by stones getting above the ball, so that the water could not be shut off.

Mr. RAWLINSON said, he never, in the use of many hundred ball valve fire-cocks, met with such a case. The

water must be in a sad state in which there were stones and dirt enough to render a ball valve inactive.

A GENTLEMAN inquired whether Mr. Braidwood could furnish the comparative number of fires in London and Paris.

Mr. BRAIDWOOD said, he could not do so at that moment, although he was in possession of those statistics. In Paris they had a brigade of 840 firemen, and, as had been stated, the floors were mostly 3 inches thick of solid plaster, extremely uninflammable. Messrs. Fox and Barrett's system of fire-proof flooring was the one he had alluded to in the paper, as being, practically, the best within his knowledge, but he did not mention any names, preferring not to do so. With reference to the fire annihilator, he was sorry to be thought to cast any slight upon that invention. He had purposely avoided mention of it, inasmuch as he had seen several, and heard of more, experiments with the machine which were not successful, and if an invention failed when experiments were tried, it was open to the impression that it might fail when brought into actual operation, and he had heard of many cases where the machines had met with accidents,—that at Drury-lane Theatre amongst the number. Therefore, he did not wish to say anything about it. His impression, however, was, that water would do whatever the fire annihilator could accomplish, and would also do many things which the annihilator could not. As it was, they had some 40 or 50 different articles to carry with each fire engine, and to add to them such unwieldy things as fire annihilators, would be to encumber the men more than they were at present, with a very doubtful prospect of advantage. He would only add, with regard to the 15 feet of tubing, which Mr. Braithwaite said caused the accident at Drury lane, that the tube was applied by one of the Company's own men, who ought to have been acquainted with the properties and capabilities of the machine he was using.

The SECRETARY has, since the meeting, received the following communication in reference to the discussion reported above:—

Office of the Fire Annihilator Company,
105, Leadenhall-street, London, 21st May, 1856.

SIR,—At the meeting of the Society of Arts on Friday evening last, Mr. Braidwood, in acknowledging the vote of thanks, replied shortly to the different points which had been raised. He (*inter alia*) put in a defence to the communication which I had the honour to address to you, and which was read at the commencement of the evening's proceedings. I rose to reply, but was checked very courteously by the chairman.

As I had not the opportunity of reply at the meeting, I beg you to insert this letter in your next publication.

Mr. Braidwood stated that he had purposely omitted reference to the Fire Annihilator; that he had witnessed experiments which had failed; that a machine had blown the hose off, and then alluded to the accident at Drury-lane Theatre, noting, at the same time, Mr. Braithwaite's explanation.

Mr. Braidwood cannot surely intend that the above shall be taken as his answer to the case which we have put forward.

The experiments to which Mr. Braidwood referred took place in 1850, *more than five years ago*. We can afford to give Mr. Braidwood the full benefit of any objections which he can find on those experiments. In the first working of an invention insufficient results, and often failures, ensue. Experience suggests improvements, so with the Fire Annihilator. During the intervening five years much has been done. The several successful trials at Liverpool, Manchester, Leeds, Stockport, Portsmouth (by order of the Lords of the Admiralty), Gravesend, Millbank (before members of both Houses of Parliament), Lord Derby's, Knowsley, Battersea (before Sir J. Herschel and others, Jury of Great Exhibition, 1851), and other places, and the still more conclusive evidence of facts

of use at casual fires, recited in my former letter, fully establish the practical character of the instrument, and nullify any conclusions drawn from first experiments. The fact of the vapour having blown off the hose proves only that the hose was not suitable. The occurrence at Drury-lane Theatre was accidental and exceptional, and has no bearing on the sufficiency or otherwise of the machine. In support of this explanation, we may fitly quote the following observations of Mr. Arden—one of the Committee of the theatre, and a fellow of your Society—contained in a letter bearing date the 26th ult.:—“It is much to be regretted that your experiments with the fire-annihilator, at Drury-lane Theatre, the other evening, should have failed. However, I believe that it was purely accidental, and no proof of the inefficiency of the annihilator, if properly brought into action in case of fire. . . . My confidence in the utility of the annihilator still remains the same.” The explanation by Mr. Braithwaite, that the pipe used was too long, was an error. Mr. Braithwaite not being aware of the facts, I did not correct the misapprehension at the time, because I was unwilling to intrude upon the notice of the meeting on a point immaterial to the subject under discussion, and felt also that any such correction would be discourteous to a gentleman addressing the meeting in our favour; and I now simply note the error in reply to Mr. Braidwood's observations.

Mr. Braidwood has not answered our FACTS.

It is open to Mr. Braidwood to dispute the facts, or to show that the facts adduced do not justify our pretensions; but it is no answer to refer to first experiments, five years ago, or to adduce the trivial and exceptional occurrences noted above.

Mr. Braidwood having, by his paper, invited discussion, we feel justified in pressing him for a distinct reply to our case of facts; and in order to bring the question to a fair issue, *hereby challenge Mr. Braidwood to justify his neglect of the fire-annihilator as an auxiliary power, in the face of the facts of successful use by the Leeds Fire Brigade and others.*

I am, &c.,
J. E. B. CURTIS, Secretary.

TWENTY-THIRD ORDINARY MEETING.

WEDNESDAY, MAY 21, 1856.

The Twenty-third Ordinary Meeting of the One Hundred and Second Session was held on Wednesday, the 21st inst., T. F. Gibson, Esq., F.G.S., in the Chair.

The following Candidates were balloted for, and duly elected Ordinary Members:—

Bentley, Richard.	Twemlow, Colonel George.
Miller, Capt. Thomas, R.N.	Tylor, Alfred, F.G.S.

The following Institution has been taken into Union since the last announcement:—

416. Birmingham, Messrs. Chance's Glass Works Library and Reading-room.

The paper read was—

THE BRITISH SILK MANUFACTURE CONSIDERED IN ITS COMMERCIAL ASPECTS.

By THOMAS WINKWORTH.

At the close of the Great Exhibition of 1851, and at the suggestion of H.R.H. the President of our Society, lectures on subjects arising out of it were delivered in this room by some of the most eminent men of the day, on those branches of knowledge which they best understood. The Council have adopted a similar policy during the

current Session, and have encouraged the production of papers having more or less reference to many departments of the recent Paris Exhibition, in which British industry was represented. We have had papers bearing directly or indirectly on coach-building, the manufacture of iron, glass, cutlery, and carpets; also on photography and design, the authors of all which were gentlemen competent by experience or acquired information to do justice to their several themes. It falls to me to offer some remarks on a very interesting and important branch of human skill, of considerable antiquity, and affording no ordinary scope for the development of art, taste, and science.

I was for many years, in early life, engaged in the manufacture of silk goods, and have ever taken a lively interest in its prosperity. It is the Class in which I had the honour to act as Juror, both in 1851 and 1855; and on the latter occasion I had the pleasure to find myself associated with the friend who now occupies the chair. It was also my fortune to be selected to report upon the Class in 1851; and, at the request of the Board of Trade, to do the same in 1855. On this last occasion I found it desirable to put myself in communication with several of my co-jurors on the Continent, and to collect, from all available sources, facts and opinions bearing on the subject. Of these I embodied as many as were necessary to the illustration of the points on which I was asked to treat, and intend now to make use of such materials as were left on my hands, in addition to what I have since gleaned, so far as they may bear on the immediate objects of my paper. I may, however, find it necessary occasionally to quote from myself, not perhaps in language but in idea.

As in that report which, with others, has been recently printed, I entered very fully into the history and statistics of this manufacture, it is sufficient for me now to say, that in this country the trade has never been permitted the advantage of free development. Up to the year 1826, absolute prohibition of foreign manufactured silks was the rule—occasional relaxations the exception. The effects of this erroneous policy were painfully evident in the vicissitudes to which all engaged in the trade were from time to time exposed. At length, Mr. Huskisson, the great and undaunted pioneer of those true principles of political economy which have since received such universal acceptance in the modification or repeal of duties on imports, succeeded in removing from our commercial code that strange anomaly which the laws affecting this manufacture presented; and, instead of absolute prohibition, foreign silks were allowed to come in at a duty of 30 per cent. *ad valorem*. As the margin, however, between this extravagant impost and the smuggler's commission of 12½ to 15 per cent. was so great, about half the quantity imported never passed the Custom-house. This was a condition of things so obviously mischievous, both morally and economically, that at length, in the year 1845, the nominal duty of 30 per cent. was reduced to 15 per cent., and, as a result, this illicit trade was nearly destroyed.

With respect to the history of the raw and thrown, or partially manufactured silk trade, it is sufficient for the occasion to say that, except as to complete prohibition, a similar series of "protective" inflictions, up to the year 1845, prevailed. In that year the duty on thrown and raw silks was totally abolished, and English throwsters, who had hitherto been unable to find a foreign market for their surplus organzines and trams, exported, in the year 1854, no less than 205,186 lbs., affording thereby almost irrefragable evidence that a similar policy, as regards wrought silks, would be followed by corresponding advantages. It is, therefore, much to be regretted, that the import duty on foreign-made goods should still be allowed to oppress the trade. As a result, we find that whereas our exports of British manufactured silks, in declared value, were, in 1850, £1,202,368, they had only amounted to £1,507,160 in 1854, notwithstanding the increase of population in all civilised countries, from which we might naturally have expected an increased demand.

Our imports of similar goods during the same period, and I presume for the same reason, actually fell off, as in 1850 they were £2,430,369, and in 1854 only £2,310,171. On every ground this repressive policy is much to be regretted, but particularly because it limits the export of articles of British manufacture in return, in the production of which the money expended in labour, as in cotton, wool, iron, ceramic, and other goods, is generally so much greater than in that of silk, where the price of the raw material absorbs so large a proportion of the capital embarked in it.

As regards the history of the silk trade of France, it is remarkable that in some respects it resembles that of our own; those engaged in it have had to endure their privations, and to enjoy their seasons of comparative prosperity. These vicissitudes, however, are not so wholly referable to the natural results of the unsound commercial policy which has so long prevailed in that country as with us, but to those political convulsions by which it has been so often disturbed. I indulge the hope that under the sway of the enlightened monarch who now rules the destinies of that great empire, the fetters of monopoly will be broken, and his subjects be permitted to supply themselves freely from the markets of the world.

I am in a condition to produce estimates and returns of other countries where the manufacture of silks is carried on, such as Austria, Prussia, and Switzerland; but, as they are not essential to the objects of this paper, I content myself with again referring those who take an interest in such details, to the report already mentioned, in which may be found the valuable statistics with which I have been favoured by my friends and co-jurors, MM. Hornbostel, of Vienna, Diergardt, of Vierzon, and Battier, of Switzerland. This manufacture is also cultivated to a limited extent in Spain, Portugal, Greece, Tuscany, Turkey, Bavaria, Baden, and Belgium. With the East Indies, on the contrary, a large business is carried on, but the classes of goods therein produced being peculiar to the country, their introduction to Europe occasions no competition of sufficient importance to justify more than this passing mention.

These brief notices will enable us to enter into the other branch of my subject with less difficulty than if I had wholly passed them by. I have now then to inquire into "the prospects of this manufacture in our own as compared with that of other countries."

But before I proceed further, permit me, parenthetically, to observe, that I think our members can scarcely have failed to notice that in most of the papers to which I have alluded as bearing on the recent Exhibition, certain points have become, as it were, stock topics of discussion, such for instance as the alleged decadence in British taste and execution, and a disposition to pass off inferior articles as of better quality and value than they really are. I fear that in the course of this paper I shall be obliged to inflict on my hearers some additional considerations connected with them, but I cherish the hope that they will be all exhausted, if not settled, before the close of the present session, so that during the ensuing one, our time may be otherwise occupied. It is not pleasant to feel oneself compelled to admit, qualify, or deny charges which, if true, ought to be exposed, and if false, to be refuted, but it is a duty we owe to the cause of truth, to meet them in a spirit of candour, faithfulness, and charity.

The first difficulty in the way of a more extended foreign trade is, undoubtedly, that which arises out of those anomalies of fiscal exactions to which I have already alluded. So long as France continues to impose a nominal import duty on silk goods of 11, but in effect of 33 per cent. *ad valorem*; and Austria, Prussia, and Switzerland, one averaging from 15 to 25 per cent., an extensive export of our silk manufactures to those countries cannot be expected, nor, indeed, until we repeal our own import duty of 15 per cent. *ad valorem* on the same productions, are we in a condition to urge it on other governments. So alive, however, have the silk

manufacturers of Manchester been to the injurious operation of this impediment to the progress of free trade principles, that in 1852 they presented a memorial to the then Chancellor of the Exchequer, desiring its total repeal. Nor are these views as to the injurious effects of high or indeed of any tariffs as regards this trade confined to a section of our own countrymen; they are reciprocated by my enlightened friend M. Arles Dufour, of Lyons, the president of our Class, and the much respected secretary of the Imperial Commission, and by the foreign correspondents already mentioned, all of whom may be considered as the exponents of the manufacturing intelligence of the countries they represented at the Paris Exhibition. In answer to my inquiry as to whether any and what injury would arise from the removal of all imposts on this manufacture, they one and all, without a single exception, declared that whatever the immediate effect might be, the ultimate one could not fail to prove highly advantageous. It is encouraging also to find that other countries besides France and England are exerting themselves in the same direction. In Belgium, in particular, a great effort is being made to obtain the removal of import duties on many important materials, especially on pit coal, iron and cast iron, by "l'Association Belge pour la Réforme Douanière," under the presidency of our energetic friend and member, M. Corr van der Maëren, of Brussels, and I may, I believe, safely add with every probability of success.

I may here also mention, that a congress of representatives from all countries will be held at Brussels in September next, to discuss the whole subject of the commercial restrictions now existing, and to suggest measures for their early removal. I yesterday received another letter from Mons. Diergardt, the eminent silk manufacturer in Prussia, already referred to, in which he says, "The progress of British manufactures, since the introduction of a more liberal commercial policy, will, I flatter myself, be an encouragement to proceed further in the same direction, and thus prove to the world that England does not fear competition. Already many articles of cotton, linen, and wool, can enter free of duty, and if silk, silk mixed, and similar manufactures were also exempted from fiscal imposts, the advantage would be so manifest, that France and other countries would be compelled to follow the example." As Mons. Diergardt, who thus freely expresses himself, is a member of the Prussian Chamber of Representatives, it augurs well for the progress of sound commercial legislation in that country.

But, besides all this as regards Prussia, we have, within the last few days, received pretty authentic information, that the word "prohibition" is to be expunged from the French import code. This, then, is also an important onward move, and illustrates the opinion I have already expressed as to the rapid progress of true principles of political economy in that country.

The next difficulty I shall notice is that which arises out of the much vexed question of taste, for I wholly deny and ignore any and every theory which would imply an inability to produce goods in this country, whether plain or fancy, as perfect in all respects as those of other nations, always allowing for such impediments, if any, as may be ascribed to the varieties of climate. The differences which may and do exist are, in my humble opinion, wholly referable to the greater or less encouragement which manufacturers have to produce particular classes of goods. Thus, those of one country—Switzerland for example—may, from local circumstances, successfully address themselves to the production of a low quality of goods, and thus rival in similar articles those of other countries not so favourably situated, while in France, on the contrary, they may attain a corresponding degree of perfection in rich fancy silks, for which the prestige and demand of ages, so to speak, may have gradually led the way. Although for this, and, perhaps, other reasons, I am prepared to admit that our French competitors exhibit a greater aptitude for invention and combination in design

than ourselves, it is not quite so clear that they have arrived at their present acknowledged superiority without committing many offences against the received principles of pure taste. In what these principles precisely consist, doctor's differ, but it is not difficult to say in what they do not consist. I presume we should have no hesitation in admitting that designs, whether woven or printed, which introduce trees, houses, or animals, are hardly suitable for the personal wear of ladies, and that the varieties of the mineral kingdom and the elements necessary to our existence, are still less so, and yet all these have had their origin and turn in France in my day. But of all the extravagant vagaries of a spurious taste, perhaps the one I now exhibit is the most extraordinary. I purchased the material on my first visit to Paris in 1814, and as at that time all foreign silks were contraband in this country, I was obliged to have it made up into a waist-coat, which I actually wore there for a few days, the size and cut of which would hardly suit my enlarged proportions and advanced years. It comprises the profiles and names, woven in satin, of the so-called liberal deputies of that day, such as Lafayette, General Foy, Benjamin Constant, Manuel, Dupont de l'Eure, and others. I also produce some specimens of the first-mentioned style, in which we shall find peacocks and other birds rather gracefully designed and tolerably well executed, except as to combination and colour, but not exactly what would now be recognised as of first-class taste; these I brought from Lyons about 25 years since. In fact, nothing has been too bizarre to be made and sold if originating in France, while, on the other hand, few silks, however exquisite and pure in design, if first produced in this country, can find a ready sale. But it would be unjust to our neighbours to assert that these designs would now be tolerated, or that even when produced they were held in much esteem. A glance at the Lyons department of the recent Paris Exhibition must have been sufficient to convince even the most sceptical, that in skill and taste their designers are far in advance of those of other countries, and no visitors to that superb collection were more ready to acknowledge its claims to admiration than our native producers. If, then, these last are really so alive to what would, without qualification, seem to be a humiliating fact, it may be asked why do they allow themselves to remain in the wake of improvement? I think I can, to some extent, solve the mystery. Fashion, whose laws all who would not desire to be singular must obey, holds her court in France, and the prescriptions of time have confirmed her claims. Her behests are as arbitrary and inexorable as they are capricious, and her votaries must conform themselves thereto, whatever the result as to the suitability of the prevailing style to their figure or complexion. Even the seasons must be reversed if the goddess wills it, and ladies be clothed in designs of marble in the summer and of lightning in the winter, as I have witnessed in days gone by; in fact, to refuse to sacrifice at her altar, would be to avow oneself an infidel to her pretensions and to brave the penalty.

But, after all, are our silk manufacturers so far in the rear of tasteful design as is so hastily assumed? It consists with my knowledge that many of the best designs which are brought out at Lyons have their origin in this country. I know that English buyers in that market often suggest the patterns and mixtures they wish to have made for them, and for which, as the goods are of French origin, the French manufacturers have the credit. I have also seen, in former days, goods exposed in our windows as "real French, just imported," which I knew to be made in Spitalfields or Manchester. Of course, no respectable house would lend itself to such fraud, and it is to be regretted that prejudice should ever afford, as it too often does, temptation to imposition.

So much has been recently said in this room on this question of taste in design, that to pursue it further would on my part, be altogether supererogatory. I am not qualified to enter the lists with such authorities in their several

departments as Messrs. Ruskin, Peter Graham, Crace, Whytock, Crossley, Redgrave, and though last, not least, the Master Cutler of Sheffield; most of whom have, during the present session, announced principles with a happy combination of talent, experience, and illustration, to which I can lay no claim. I have listened to their theories and arguments with much interest, and, I trust, some profit; and if I cannot agree with all of them, it is, I suspect, because scarcely any two of them agree with each other. I have, however, arrived at the conclusion, that there are some standards which we can scarcely hesitate to recognise as genuine; that, to appreciate them properly, we must be educated up to them; and that they are not to be confined within the narrow limits of a single style, but are as extensive and varied as the materials in or on which they are to be executed, and the uses for which they are ultimately destined. Towards the accomplishment of these desiderata the establishment of schools of design has largely contributed, as have also the opportunities afforded to the masses in England by the many gratuitous exhibitions of the best specimens of art-manufacture, at Marlborough House, Kensington Gore, and elsewhere, in London, and by similar ones in other great cities and manufacturing districts; and to the more wealthy, by international exhibitions, where they could contemplate, under one roof, the artistic results of the congregated talent of the whole civilised world.

But there is another impediment to the free exercise of manufacturing talent, to which I have already incidentally alluded, but of so important a character that I must again give it prominence.

I am afraid that the prevailing disposition to estimate intrinsic merit by extent of demand, is rather calculated to lower than to raise the standard of excellence. Immediate saleability is with too many esteemed as the criterion of value, and those are bold men who for the sake of personal or national reputation, venture extensively on an independent artistic field of production. There are certainly a few who take more comprehensive views, and place greater reliance on the ultimate triumph of true general principles, but, undoubtedly, the bulk of our weavers are employed in the manufacture of goods to suit the million, and, as a natural result, taste is too generally placed in abeyance or made subservient to pecuniary considerations. Co-ordinately with this demand for inferior goods, a low tone of morality seems to have taken possession of the commercial mind. Stimulated perhaps by excess of competition, or by a desire to acquire wealth easily and rapidly, something very nearly akin to fraud is sometimes perpetrated. The demand for what are erroneously called "cheap" goods, leads to the production of articles in which inferior materials are made still more so, by the adoption of doubtful means for reduction of cost. It is true that many of these fabrics are made to order, and are generally sold to parties who know what they are buying, but I cannot recognise the distinction which producers of this class sometimes endeavour to establish between those who make and those who afterwards sell as genuine, spurious or defective goods. There may be degrees of complicity, and though it may be true that if there were no buyers of such articles there would be no sellers, it is equally true that if there were no sellers, there could be no buyers; those, therefore, who seek for absolution on such pleas, must have a very inadequate moral perception of their social obligations. It would, however, be a melancholy consideration, and require a more extended notice than I could venture upon, if these practices, which are certainly not confined in their character to the silk trade, obtained to any serious extent. We denounce them, it is true, wherever and in whatever manufacture they are found to exist, whether in our food or in our clothing, but I would fain believe that they are the exception and not the rule of modern commerce.

As, however, some compensation for this evil, I have pleasure in recording the fact that, there is probably no

manufacture which has groaned less under the incubus of patent law than this. Numerous inventions have been from time to time introduced, principally by the operatives themselves, for the simplification and lessening of their labour, and the more ready production of expensive fancy goods, but with a patriotic disinterestedness worthy of all praise, so far from seeking exclusive advantages, and looking with suspicion and jealousy upon others who may be travelling on the same road of improvement, they have invited criticism, adopted suggestions, and acknowledged obligations. Instead of contemplating, in a spirit of detraction and envy, the talents of others, which is too often one of the unfortunate characteristics of this over-estimated monopoly, I have frequently enjoyed opportunities of witnessing, amongst my own workpeople in former days, their readiness and even anxiety to give honour where honour was due. In this Society, and at a time when we never rewarded patented inventions and improvements—for objections to patent law are not of modern growth—there are some old members who, like me, may remember that amongst the candidates for medals and honours, the most ingenious and numerous of a class were the weavers of Spitalfields. A sense of justice and gratitude has dictated this cheerful tribute to the character of a body of men with whom I have had many friendly contests on important questions of political economy affecting their interests, to whom I owe much, and to whose talents, industry, and exemplary conduct as a body, with less than the average of exceptions, the country is largely indebted. With respect to the almost entire immunity from the repressive influence of patent law enjoyed by this manufacture, even the introduction of the Jacquard loom in 1820 forms no exception. It is true that Mr. Stephen Wilson, by whom it was brought over from Lyons at great personal risk, took out an English patent for it in the first instance, and granted licenses for the use of it, from which he might have derived a large revenue, but finding in a short time that many manufacturing interests were likely to be injuriously affected by the fettered use of the invention, and that to retain his patent would be to shut the door to all improvements upon it, he very disinterestedly and patriotically gave up to the public all right and title to the advantages he had legally secured to himself. In consequence of this, the machine has been adopted, and the use of it extended to many other branches of manufacturing industry, and many improvements, not, perhaps, in principle, but in details, have been effected. It is now applied as well to power as to hand-loom weaving, and, as we all know, the economy of labour and expense is beyond all calculation. Our member, Mr. Edward Wilson, having promised me the favour of his attendance on this occasion, I shall not enlarge further upon the subject, as I have no doubt he will supply any necessary explanations, and more than confirm all the important facts I have adduced respecting his father's claim to the gratitude of the manufacturing interest. I esteem it a great honour to have enjoyed the friendship of Mr. Stephen Wilson from my earliest introduction to active life.

Having, at greater length than I could have wished, brought into review some of the more prominent difficulties with which the British silk manufacturer has to contend in the race of foreign competition, it remains for me to inquire whether, in spite as it were of them, he may not calculate on a continued increase of demand. Undoubtedly the imposition of heavy import duties is a formidable impediment to an export trade, but, except as to the precise market in which he is competing, all nations are on an equal footing. Thus in France the English, Swiss, and Prussian manufacturers are on the same level with each other, but have equally to contend with the protected producers of Lyons and St. Etienne; but in the United States, where no such manufacture is carried on, all competitors have the same chance, the import duty being the same on all. It is here, therefore, and in countries similarly situated, that the productions of manufacturing talent have the freest scope.

At this moment, perhaps, the articles in which the greatest competition exists, both in the home and foreign markets, are of the lower and middle qualities, as in plain silks generally, small stripes and checks, barred or cross-over glaçés, moiré antiques, satins, velvets, &c., in all of which, as well as in many varieties in ribbon, our manufacturers enjoy a fair and increasing share of profitable sale. Even in goods of a higher class, where the cost of production is greatly enhanced by the introduction of different raised textures, involving the highest order of artistic taste and combinations of colour, they are gradually obtaining a position from which it would not be easy to dislodge them. Towards this "consummation so devoutly to be wished," the advantages of comparison afforded by the Paris Exhibition largely assisted. Of this I had some evidence when in that city, one of the largest buyers on the Continent for America having assured me that he was agreeably surprised to find by that means that he could now purchase many kinds of British silks on better terms than those of other countries. I am also informed on good authority that subsequent increased demand in Manchester, for the transatlantic markets, has fully confirmed this opinion. On this point Mr. John Chadwick, a silk manufacturer, of Manchester, who has written to me within the last few days, says—"I can still confirm the opinion formerly expressed, as to the effect of the Paris Exhibition on the export demand for our goods. Orders, perhaps individually small, but in the aggregate considerable, were given in this market for the United States, for the spring trade, and large orders have been given for the autumn. I am informed, moreover, that the goods sent out from hence have proved satisfactory, although there has been a glut of silk goods in the New York market. Indeed, I feel no doubt whatever that we are now (in spite of Government regulations for crippling the silk trade) establishing gradually, but permanently, a footing in the United States. I cannot, of course, pretend to say that all this results from the Paris Exhibition, but there can, I think, be no doubt that to a large extent such is the case." Nor must we forget that the introduction of power-loom weaving has proved to be a powerful lever for the production of comparatively cheap articles, of which no nation is so able and willing to take advantage as our own. I forbear, however, to press these points further, as I flatter myself that the favourable inferences to be drawn from them as to our future, will be readily understood and accepted by the intelligent audience for whose information I have collected these materials.

As this is probably the last occasion on which a paper will be read originating in the recent Paris Exhibition, I may be expected to say a few words as to the position which our English silk manufacturers held in it. They shall only be a few words, for as, in the report I presented to the Board of Trade, I entered rather fully into the question, it is the less necessary I should do so now. Bearing in mind the old proverb, "qui s'excuse, s'accuse," I must nevertheless protest against the display we made therein being taken as evidence of condition, whether of decline or progress, for it is well known, and much to be regretted, that our manufacturers did not respond very heartily to the invitation to exhibit, and that the greater number did not exhibit at all. The inconveniences and pecuniary sacrifices to which they were exposed in 1851, without deriving, as they believed, any compensatory result, had indisposed them cheerfully to submit to a fresh demand on their time and property; for, on that occasion, they were not only required to be ready long before the inauguration of the Exhibition, but had no uniform, lofty, and adequate space assigned or allowed to them. Their French competitors, on the contrary, had both time and space placed at their disposal, of which they did not fail very fully and freely to avail themselves. But this actual, though probably not intentional unfairness, was not the only annoyance of which they had reason to complain. In consequence of the rule which then permitted and even invited other than original pro-

ducers to exhibit, many of them found portions of their manufacture exposed to competitive view, which being made to order and with only a limited discretion as to price, design and combinations of colour, had no claim to peculiar merit. In addition to all this, it must, I fear, be admitted, that the theory of international exhibitions is comparatively new to our manufacturers; they do not generally believe, nor indeed do I, that the award of medals is conducive or necessary to the profitable sale of their goods, and are content with those legitimate channels for the disposal of the products of their skill and industry which are open to all. I trust, however, that should another opportunity of the same kind ever present itself, it will be readily embraced, for the necessary rules and arrangements are now better understood, and it must be admitted, that on the late occasion, the appropriation of space was fair both as to quantity and locality. I cannot doubt that future Exhibitions will be conducted on similar principles of liberality and equity. At the same time I am not without my fears, that if at any future international exhibitions the Jury system be continued, many of our manufacturers, especially in this particular branch of industry, may still hesitate to become competitors. Although the number of medals and other distinctions awarded to them on the recent occasion, bore a fair proportion to those assigned to other exhibiting countries, the matter-of-fact character of our nation prevents us from recognising in the decisions of jurors anything approaching to a correct test of relative merit. This question has, however, been so ably and fully discussed by Mr. Cole, in his recent report to the Board of Trade, that I refrain from noticing it further than to suggest that intending exhibitors on any future occasion may, if they choose, make it a condition that in the event of the Jury system being still continued, their collection may be exempted from its operation.

The advantages of the theory of periodical international exhibitions are too patent to require further comment. If they have already resulted in a more extended commercial intercourse; in a better appreciation of what is worthy of admiration in national character; in the cultivation of civilising influences in countries where they have been hitherto but imperfectly understood, and in the removal of long cherished prejudices, they have only realised the expectations of those of this venerable Society with whom the great experiment originated. I, of all others, might without undue assumption well claim for us this merit, if it were for a moment a matter of doubt, for I had the honour to occupy the chair of the Council on the 26th of July, 1849, when the question of a national Exhibition was finally discussed; to urge its impracticability, from past experience under our roof; to suggest the probability of one to be "open to all the world" being extensively and profitably responded to; and to assist in drawing up the memorable resolution on which the realisation and triumphant success of the project was founded.

It only remains for me to request attention to the many specimens with which I have been favoured, by Messrs. Walters and Son, of furniture silks of their own manufacture; by Messrs. Jackson and Graham, of similar goods of Irish, India, and French manufacture; by Messrs. Swan and Edgar, and Messrs. Lewis and Allenby, of garment silks of British and of French manufacture; all of which are, to a certain extent, illustrative of the present condition and relative merits of the countries in which they were made. But, as they were not collected with a view to an ordeal of this nature, and the greater part are supplied without the consent, or even the knowledge, of the original producers, we must not look upon them as other than proximate evidence of ability in their several departments.

I think they will fully confirm the various opinions I have ventured to advance in the course of this paper, and afford us additional encouragement to believe that, "all other things being equal," a vast field for the profitable investment of capital exists in the silk manufacture of this country.

DISCUSSION.

The CHAIRMAN said, if his friend Mr. Winkworth had read this paper in the year 1846 instead of 1856, he knew the question that would have occupied the greater part of their time that evening, viz., the great question of free trade. That subject was, however, set at rest; at the same time, there were many important points arising out of the paper with regard to our silk manufactures—the markets into which we might introduce our goods, as well as the kind of material adapted for the export trade. The question of taste was a very inviting one, and there were probably gentlemen present who might think the British national taste should not be so much despised as it sometimes was. Another important question was that of low prices and cheap goods, which required to be well discussed.

Mr. DILLON said he had not come prepared to address them in detail on this subject. It was, however, one to which they were doubtless aware he had directed his attention for a great number of years. The thing which most struck him in the very able report of the gentleman who had favoured them with the paper that evening, was the very different position in which the silk trade of this country now stood from what it formerly occupied, and the different point of view in which they should regard it. It was now more than a quarter of a century ago since he addressed a public meeting of the silk trade on the subject of free trade in reference thereto, and it was only with great difficulty that he could obtain a hearing, and this led to his addressing a series of letters to the *Times* newspaper, under the signature of "Delta," by which he was exposed to a good deal of obloquy—he was going to say danger, and which also led to some difficult legal proceedings. He mentioned this to show the difference of opinion in the public mind at that time as compared with the present. Many would remember that not only was depression to the English silk trade predicted, but its total extinction was prophesied as the results of free trade in that commodity. It was maintained that our home trade would be completely destroyed by foreign competition. He remembered when the Jacquard loom was first introduced, that it was taken to Coventry, for the purpose of being applied to the ribbon manufacture; an objection was then made to it that the roofs of the workshops were too low to admit it. It did not seem to occur to the parties that if they could not reduce the loom they could raise the roof of the buildings. A curious instance occurred of the malignity with which the question of free trade in silks was received. A celebrated manufacturer in the City, who attended a sale of East India silks, showed him, on the fly leaf of his catalogue, a full-length effigy of Mr. Huskisson, hanging in chains. Mr. Dillon said he had not come prepared with statistics, but, in fact, the best statistics were amply furnished in that room. The country that could produce the specimens now before them scarcely need to enter upon the question of taste, and need not defend itself on that ground. The question of prohibition in this country was at an end, and the hope existed that the same policy would, ere long, be adopted in other countries. But there was another thing which should also cease to exist—that was—what was called encouragement by means of duties. Freedom of trade would never be fairly established until the rule obtained,—that taxes were levied for revenue only, and not for the purposes of protection—and that, too, for the supposed good of the parties who were thus considered to be protected. He remembered at the time he alluded to it was said, that the silk trade of this country required fiscal protection, because it was then in its infancy—an infancy of nearly 200 years!—and in infancy it would still have remained if it had not been relieved from the so-called protection. With regard to the comparative manufacture of different countries, it could not but be admitted that climate and other local circumstances were more adapted in some countries than in others for the production of a particular fabric; but it did not follow that England could not pro-

duce good manufactured silks. It might be that the class of silks might be different in England from those in France. If prohibition were removed, and taxation for the purposes of protection abolished, he was persuaded that a great intercourse would exist between England and France, and manufacturers both in England and France would be mutually benefited and improved by the competition which would exist between them. If it had been his intention to have addressed the meeting he could have brought with him some specimens of English manufacture many years ago, of which they would never be ashamed. He was, indeed, persuaded that nothing had more tended to improve the English manufacture of broad silks, ribbons, gloves, &c., than the competition into which they had been forced by the introduction of French goods. There was another thing of which they need not be ashamed—and that was—that the French manufacturers admitted that they too had been benefited and improved by their commercial intercourse with the English manufacturers and the consumption which the English market afforded. As he had before said, the benefit and improvement were mutual. On the subject of taste it was a difficult thing to form an estimate, but his own impression was, that for the purposes of manufacture the English had quite enough taste. He thought, in the discussion of this subject, too much importance was attached exclusively to the subject of mere taste. The silks which ornamented that room were intended for use. He, of course, did not object to beauty of pattern or design, but he thought too exclusive importance was attached to pattern, taste, and colour, and even if the French excelled in taste and beauty in their superior articles (although he saw specimens now before him which disputed that position), still in the English manufactures they had the useful article for the hundred, the thousand, and the million. He now came to a subject which was a difficult one to touch upon—that was cheapness. He submitted that there was a serious objection to the attacks that were frequently made upon cheapness, as injurious to our manufacture. If an article, sold cheap, were a forged article, purporting to be what it was not, then, indeed, cheapness was objectionable, but he contended that cheapness, so far from being an injury, was a benefit. Besides, the representing a thing to be different from what it really was, was not confined to cheap, but might equally extend to dear, goods. He thought it was quite a mistake, and his friend who had read the paper must excuse him if he combatted his opinions on that subject. He thought it was a mistake to represent the English public as so devoted to cheapness, that the manufacturer, in seeking cheapness, destroyed quality and depreciated the goodness of the articles. If a thing was charged a certain price, and was worth as much as was charged, there was no deception. Silk, unlike Barry's picture, was an article of use and comfort, as well as of taste, and the improvement in the manufacture, the talent and the skill displayed in the making of a cheap article, extending the luxury from the hundreds to the thousands of the people, was a national advantage. Nothing, he thought, would tend more to the removal of all prohibition than the petition of the people of Manchester, for the removal of all taxes except taxation for the purposes of revenue; and that there was that talent and enterprise amongst the manufacturers of England that would enable them successfully to maintain their competition with the world, no one could doubt.

Mr. EDWARD WILSON said, his name having been unexpectedly introduced in the paper—and that of his father—perhaps naturally so—as the introducer of the Jacquard loom into this country, it might be expected that he should offer a few observations. In looking at this paper as to the prospects, compared with other countries, of the silk manufacture, they must go back to the difficulties with which the trade in former periods of our history had had to contend. The origin of the silk trade in this country, he thought, might be dated from the period of the repeal of the Edict of Nantes, when

refugees from religious persecution came over to this country and settled at Canterbury, and there produced an article composed partly of silk and partly of cotton, which obtained the name of "Canterbury muslin." These refugees afterwards migrated to Spitalfields, from which period the silk manufacture of this country might be dated. He could not state the year, but it consequence of depression in the trade, some turbulent outbreak occurred amongst the weavers, which resulted in the passing of the Act called the Spitalfields Act, which authorised the magistrates sitting at Clerkenwell to fix the prices which the manufacturers were to pay the journeymen weavers for their work. Mr. Wilson then proceeded to give an interesting history of his father's detention in France, at the conclusion of the short peace of Amiens, in 1802, which eventually led to the introduction of the Jacquard loom, which he brought over under circumstances of great personal risk. He also gave an account of the vexatious proceedings that occurred between the weavers and their employers, alluding to the exorbitant demands that were made by the workmen for the production of any new and superior fabric or design either in silks or shawls; but, he remarked, at that time both the manufacturers and the weavers appeared to be doing well. He then alluded to a pamphlet of the day, which was published anonymously by his father, after having been revised by an eminent member of the firm with which Mr. Winkworth was formerly connected. This pamphlet exposed the abuses to which the trade was subjected under the operations of the Spitalfields Act, and he believed it was mainly instrumental in bringing about the repeal of that Act. Having alluded to the difficulties which attended the first introduction of the Jacquard machine, and described the various mechanical difficulties that had to be overcome before the loom was brought into successful operation in this country, Mr. Wilson passed in review the incidents connected with the reduction of the import duty on silks, under the measure introduced by Mr. Huskisson, and the effects which that measure had produced upon the trade generally. He then remarked that from that period might be dated the success of the silk trade in this country, from its being able to rival that of the foreigner; and he had no hesitation in saying that, if they had the same markets, and could get rid of the surplus stock of fancy silks made in this country, there was no country in the world more capable of producing a fabric perfect in manufacture, combined with artistic excellence. Mr. Winkworth seemed to regard the falling off in the imports of foreign silks as a matter of regret. He (Mr. Wilson) could not say he regretted it, because he believed it would be found that the falling off in the introduction of foreign goods was occasioned by their being superseded by our own manufactures, the manufacturers of England being better able than formerly to produce that which suited the taste and the markets of this and other countries. Upon the subject of the artistic taste of the day, as to the articles which were most in use, Mr. Wilson proceeded to mention the changes which occurred in the taste of the people—instancing the fact that at one period no gentleman would use any other handkerchief than the Indian Bandannah; whereas, at the present period, that article appeared to be entirely discarded, and almost unsaleable. The plain Corahs were now adopted in their stead; and this change of taste and the imperious dictates of fashion, he said, had often produced the most disastrous results to the manufacturers.

Mr. PETER GRAHAM mentioned that the particularly splendid specimen of furniture silk to which allusion had been made, had been manufactured for the decoration of the new ball-room at Buckingham Palace, and was certainly a *chef-d'œuvre* of Messrs. Walters and Son, by whom it was manufactured. With reference to the comparative excellence of the silk manufactures of England and France, in the branch with which he was most acquainted (furniture silks), he thought France had the market of the world, and that in that department France would maintain a superiority

which the English manufacturers could not rival until they were prepared to embark colossal fortunes in the trade; at the same time, he believed there was no branch of the trade in which more progress had been made during the last 10 or 12 years than in that to which he had alluded.

Mr. STEPHEN LEWIS referred to the benefits that had been conferred upon the silk trade by the reduction of fiscal duties, upon broad silks in particular. He attributed much of the success of the French manufactures to the very complete organisation of the trade which existed in that country. With regard to the alleged superiority of design in the continental manufactures, he thought it was owing, in a great measure, to the art of designing being made a profession, for which a suitable education was imparted; and another advantage was, that the designers were kept in constant intercourse with the manufacturers and the buyers. With regard to silk fabrics, he thought the specimens exhibited by the School of Design were as good samples of garment silks as could well be imagined.

Mr. BRAY, of Coventry, at some length took up the question of cheap goods as applied to the manufactures of that town; cheapness, in many cases, he said, partaking of adulteration. With regard to the superiority of the French, both in design and colour, he attributed it, in a great degree, to the national character—the love of display and effect. He referred to the facilities afforded to the ribbon trade of Coventry by the application of the Jacquard loom and steam power to silk as well as to cotton manufactures, and he had no doubt that the manufacturers of England would eventually be adapted to the requirements of all the markets of the world.

Mr. WEBSTER (of the firm of Cornell, Lyell, and Webster) replied to some of the remarks of Mr. Bray, with reference to the cheap productions of that town. He thought one great evil connected with the manufactures of Coventry, consisted in the fact that, if one house produced a really successful article, some of their neighbours would bring out a lower quality of article, of the same pattern, and sell it at a lower price in the market, thus destroying the benefit of the manufacture to the parties who had introduced it. He agreed with Mr. Lewis in the opinion, that the superiority of French designs was owing to that branch being made a profession, for which the members were properly educated. In some houses in France, as many as twenty or thirty designers were employed; and, in one case, he found that ten or twelve persons were employed in designing patterns for silks from arrangements of natural flowers. To keep up a supply of new designs, it was requisite that designers should have intercourse with each other—thus gathering ideas from one another. He knew an English house which engaged a designer at £500 a-year, but he was worked up in six months.

Mr. WALTERS remarked that, in his opinion, an extensive demand for furniture silks would enable the English manufacturers to equal the productions of France, both in quality and design. He believed the manufacturers of this country were equal to anything that might be put upon them.

The CHAIRMAN wished to add his testimony to all that had been said by Mr. Dillon and Mr. Wilson as to the mischief that occurred to the silk trade from the monopoly that existed some 30 years ago. In fact, the silk trade had been made the scapegoat for almost all the sins of monopoly in this country. They had happily got over those times, and he was glad to hear that they all agreed that the silk trade of this country had taken a very different position from that which it formerly occupied—that it had assumed an important position in the manufacturing industry of the country. He thought it was one of those branches which had derived the greatest benefit from the encouragement which the nation now seemed inclined to give, by the facilities offered, for the instruction of the artisan in the arts and sciences. Last year he spent some time in Paris as a juror of the Exhibition, and on one occasion he fell into conversation

with an eminent Lyonese silk manufacturer. He was looking over some of the beautiful productions exhibited, and expressed his admiration of some peculiar kinds of silk fabrics. The manufacturer replied, "Yes; they are very beautiful, and you would be surprised how much we owe in a work of this kind to the workman himself. It is a common practice (he added) for the manufacturer, the designer, and the customer, to agree in the general design of a pattern. We agree in the way it is to be worked, and after that it is my custom to send for the most skilful of my weavers to give him a general idea of the effects to be produced, and to ask whether he can suggest any improvements. The weaver takes it away, puts it into his loom, and it rarely happens that he does not bring it back with some improvement that I could not have devised, from my want of practical knowledge of the working, which, however, he is able to discover; and many of the effects you see here, are, no doubt, the result of the skill of the workman himself." He (the chairman) trusted the same would be the case with the Manchester and Spitalfields operatives. It now only remained for him to call upon the meeting to do that which he was sure they would do most cheerfully—that was to pass a vote of thanks to Mr. Winkworth for his highly interesting paper. It was a paper full of facts, which were put together in a clear, consecutive, and logical form; and it was a paper which was calculated to produce a great amount of good.

Mr. WINKWORTH said that he could confirm the testimony borne by the chairman, to the obloquy Mr. Dillon had to encounter in his early efforts, under the signature of "Delta," in the *Times*, to imbue the manufacturing mind with a sense of what was due to the improved intelligence of the age. He could also sympathise with that gentleman to a considerable extent; the firm with which he was at that time connected (Bell and Winkworth) in the silk trade, being one of the few who ventured to embark on the crusade of free trade. He also agreed with Mr. Dillon, that perhaps too much stress was laid upon the supposed importance of the fancy branch of this manufacture. The goods in and around the room were introduced rather as specimens of what could be done in rich figured silks; but, unquestionably, the great consumption of this country was of middle and lower qualities, in which there was little or no scope for the display of taste. With respect, however, to "cheap" goods, he (Mr. Winkworth) was still of opinion that the demand for them did lead to the introduction of spurious or inferior materials, an opinion which a subsequent speaker had too fully confirmed. In fact, "cheap" goods were generally dear goods, and no one would be more ready to admit this than Mr. Dillon himself, and to deny that the important firm with which he was connected ever sold other than really cheap goods, whether of a ribbon at a penny a yard or the richest brocade at a guinea. With the observations of Mr. Wilson he generally concurred, and thought the narrative with which he had favoured the meeting, of the introduction of the jacquard loom to this country, very interesting. The silk trade of this country did not, however, take its rise from the revocation of the edict of Nantes, as it had a recognised existence in this country as early as the fourteenth century; but the arrival of so many refugees on that occasion, certainly gave it an impulse, which, however, they subsequently took some pains to restrain. It was a remarkable fact that soon after their settlement in this country they actually obtained a patent, and ultimately an Act of Parliament, confining the manufacture of "Lustering and à la modes" to themselves, as distinguished from the English weavers, by prohibiting their importation. To Mr. Lewis and Mr. Graham, his thanks were due for the light they had thrown on the points to which they had severally addressed themselves. As regarded Mr. Bray, of Coventry, that gentleman would hardly expect that he would indorse all that he had advanced respecting the assumed difference of taste, and ability for originating novelty in design, and the physical, or he might rather say the metaphysical,

way in which he had accounted for it. Mr. Webster, however, who was an excellent authority on all that belonged to the ribbon branch, had left him nothing further to say upon it. To Mr. Walters he had to tender his thanks for the explanations with which he had accompanied the splendid display of furniture silks of his manufacture which graced the room. He had only, in conclusion, to say that, with every disposition to do justice to native industry, he had no special case to make out, being of opinion that people ought, and certainly would, always buy in the cheapest and best market, whether of home or foreign production; and to thank his brother members for the candid reception they had given to his paper, and his friend in the chair for the courteous way in which he had originated and conveyed the vote of thanks which had just been passed.

The Secretary announced that the Paper to be read on the evening of Wednesday next, the 28th instant, was "The History and Present State of the Machine-wrought Lace Trade," by Mr. W. Felkin, F.L.S.

Since the meeting, the SECRETARY has received the following letter from

Mr. JAMES VAVASSEUR, in which he says:—

"The discussion was too well sustained last evening to admit of any remarks from me on Mr. Winkworth's paper; I shall, therefore, be obliged if you will allow space for a few lines in the *Journal*, if it can be spared.

"I do not know whether it is allowed to criticise the paper, but it suggested to my mind a speech from the throne, raising expectations by its title, which it did not satisfy by its matter. Its chief merit was in its being calculated to allay the fears of our silk manufacturers, if any troubled them. I heard the paper read with much pleasure, for its style was pervaded by a certain air of good taste, which seldom fails to please, even when it does not inform or convince.

"The paper would have effected more good if it had been less encouraging and more rousing. Mr. Winkworth congratulates the silk manufacturers of this country, that British goods are sometimes sold as French. I shall think it a much greater triumph when, to facilitate the sale of French goods, shopkeepers shall find it desirable to call them British. When we have reversed the figures of imports and exports, I shall think there is some ground for congratulation. That is to say, when we export two and a half million of silk goods, instead of importing that amount; and when we do not import more than one and a half million.

"The Exhibitions of 1851 and 1855 have done this good for the British silk manufacturers—they have created an appreciation of the real position of their fabrics as compared with those of France.

"This was apparent in the discussion, when free and frank acknowledgment was made to French superiority. This is a hopeful sign, and betokens the right state of mind, from which improvement may be predicted. It will always be impossible for a manufacture to improve when those engaged in it fancy they do well enough already that there is no goal beyond to reach. I fully agree with the chairman, who after all pointed out the chief weakness to be remedied, when he said that the superiority of the French fabrics is to be referred to the superior intelligence of the workmen. I do not mean to say, that English weavers are not intelligent, but intelligence is to be reckoned relatively, and it would be absurd not to allow the superior intelligence of the French weaver. The fact is confirmed by his execution of difficult works, not in small quantities, or as pieces for show or curiosity, but as the staple of a province.

"There is a class of goods, for which the French draw all the world to their market, which owe their excellence to the intelligence of their workmen. Till our workmen-

are raised by careful education to the same rank of intelligence as the French, we cannot expect to reverse the figures of exports and imports before alluded to. We may glut all markets with our plain goods, but till a special as well as general education is afforded to our weavers to qualify them for their work, the French goods will still keep their deserved place in the esteem of all buyers of taste and refinement. I am convinced that the general education of the people, together with the special education of our industrial classes, has a most important bearing on the commerce of the country. There are some things which every person in the nation should not be ignorant of, there are other things which a few only need know, but it is indispensable that those few should know them.

"Of the morality of our weavers, as regards *meum* and *tuum*, I cannot speak very highly. The great value of the material entrusted to them excites the cupidity of unprincipled receivers, who offer temptations and facilities for pilfering, which have undermined the honesty of men, women, and children; while the weavers themselves get little by their dishonesty, the corrupt receiver fattens on the gains of their robbery. The manufacturers might be able to prevent much of this loss if a bobbin could be devised to meet certain conditions. The bobbins chiefly in use are of wood, which can easily be made heavier in many ways, silk being abstracted equal to the increased weight of the bobbin. Ingenuity, worthy a better cause, has been expended to defraud employers in this way. To remedy these evils, some manufacturers have tried metal bobbins. As they would be too heavy, if made solid, they have been made hollow, to ensure lightness, and have, therefore, afforded a chance for roguery to fill the hollow with sand.

"A great benefit would be conferred on silk manufacturers, as affording them the means of detecting and preventing fraud by their workmen, if a bobbin could be devised to meet the following conditions:—

- "1. Exact uniformity of weight.
- "2. They should be made of a material that could not be made heavier without instant discovery.
- "3. They should be made of a material which would not absorb damp from the atmosphere.
- "4. They should be made of a material not likely to affect the colour of silk wound on them.

"Most of these conditions would be met by porcelain, but its advantages would, I think, be neutralized by its liability to chip, thus exposing sharp angles, which would cut the threads wound from such bobbins. It is only by making known our wants that we can expect to have them supplied; perhaps the ingenuity of some of the numerous readers of your *Journal* may be directed to meet our wants. If so, I think I may venture to say that the inventor would meet with a sale sufficient to repay him for his outlay and reward him for his trouble.

"There is one observation I must still make, although I have already written too much, that is, that notwithstanding all the efforts of the Society to foster Schools of Design, the silk manufacturers are, for the most part, dependent on Frenchmen for their patterns. Another want of the trade is a court of appeal in case of dispute between master and workman, similar to the *Conseils des Prud'hommes*, at Lyons.

"To return to the discussion, the speech of Mr. Wilson was interesting, but not to the point; it referred to the past, not to the present. If the Coventry gentleman is to be believed, the British are prevented, by want of certain bumps on their crania, from equaling the French; if so, we had better give up the attempt at once, and save ourselves further trouble. But, as I see nothing in French excellence that may not be attained by ourselves, if we apply suitable means, I am not disposed to feel discouraged. To do justice to the Coventry gentleman, his type of British self-esteem was very well illustrated by the succeeding speaker."

EXAMINATION OF STUDENTS OF CLASSES IN INSTITUTES.

To the deputation which waited upon the Duke of Argyll, the Postmaster-General, his Grace has replied to the effect, that he is not prepared to place at the disposal of the Council any situations in the Post office to be competed for as prizes in the forthcoming examination; but that he will be disposed to look favourably on the claims of any parties who may be recommended to him by the Council as having passed their examination with credit.

On this subject, the Secretary has received the following letter, without signature or address:—

"I beg leave to offer you a prize for the approximate solution of equations, as a subject having some claim to form a part of the mathematical portion of your projected examinations. It is true that in practice the necessity for the actual calculation of roots rarely occurs, but the theory of equations is so intimately connected with every important branch of the mathematics, that it can hardly be deemed sufficient to study its general principles without applying them to numerous particular examples. Besides, the process of approximation is founded on the same principles as the differential calculus, without being encumbered with those metaphysical difficulties which cause the results of that calculus to be received with very imperfect faith, even by the most intelligent students. A simple form of calculation, by which the values of real roots, and the critical values which indicate impossible pairs of roots, may, in all cases, be easily determined, is to be found in many modern books, but as, with the exception of an article in the "Penny Cyclopaedia," I have not found many examples of the complete discussion of equations, I have written down the first figures of the roots, or critical values, of all the equations in De Morgan's Arithmetic. Accept my best wishes for the success of your important undertaking."

With the letter were received the halves of two £5 Bank of England notes.

PATENT OFFICE PUBLICATIONS.

In a recent number of the *Commissioners of Patents' Journal*, it was stated that the Commissioners' donation of official works had been transmitted to the following cities and towns:—Aberdeen, Accrington, Beverley, Birmingham, Bolton-le-Moors, Bradford, Brighton, Bristol, Bromley, Cambridge, Canterbury, Carlisle, Cork, Dublin, Gateshead, Glasgow, Great Grimsby, Hertford, Huddersfield, Hull, Ipswich, Keighley, Kidderminster, Leeds, Leicester, Liverpool, Wolverton, Crewe, Macclesfield, Gorton, Manchester, Newark-upon-Trent, Nottingham, Oxford, Plymouth, Newcastle-upon-Tyne, Newport (Monmouth), Preston, Reading, Rochdale, Rotherham, Sheffield, Shrewsbury, Southampton, Stirling, Stockport, Warrington, Waterford, Wolverhampton, Yarmouth, Wednesbury.

As it is generally believed that these grants have been hitherto limited to Free Libraries, and as it is evident that such libraries exist in but a small number of the cities and towns named, the Secretary has made it his business to ascertain the exact terms on which the donations are made. He is informed that "in the case of every one of the towns and cities named in the *Journal*, the Commissioners' donation has either been placed in a free library already existing, or has led to the formation of one for its reception. The latter has been the rule—the former the rare exception. Where a corporation exists, the donation is made to that body; where none exists, then to the magistracy, or some local parliamentary board; but always on condition of the works being rendered daily accessible to the public free of charge. Where the donees are unable immediately to provide accommodation for the

works, they are at liberty to arrange with a Mechanics' or other Institute for the temporary custody of the donation; the depositary, of course, undertaking to fulfil the original conditions of presentation."

These conditions are:—That a librarian shall be appointed to take charge of the works, who shall be held answerable for their safety and condition; that the works must be deposited in a public free library, and be open to the inspection of the public daily, and at all reasonable hours; that no charge is to be made, or fee of any kind taken, on any pretence whatsoever, for the inspection, reading, or taking notes from any of the works; and that no works be lent to any person, or removed from the library, except for binding or necessary repairs.

As the Commissioners only present their works to public responsible bodies, it remains for Mechanics' Institutes to urge the local authorities to apply for the donation, they at the same time volunteering, if desirable, to undertake its present custody.

Mr. John Plant, the Curator of the Royal Museum and Library, Salford, in a letter to Mr. Alderman Langworthy, the chairman of the committee, says that the set of Specifications of Patents presented by the Honourable the Commissioners has been numerically arranged, and bound in 410 volumes. During the eleven months they have been in use, the majority of persons who have consulted them have been working mechanics, foremen, managers, and overseers of firms. Others have been inventors and patentees, anxious to examine the claims of existing correlative patents, so as to avoid infringement of patent rights; and others, perhaps the smallest class, those interested in the general progress of the mechanical arts and of science, examine the whole of the patents as they are received at the library. The monthly issues have averaged 253 in number. The references have principally been to those patents relating to "improvements in the working power of engines," to those for spinning and weaving, and to those for dressing fibres of cotton, wool, and silk.

Home Correspondence.

REMARKS ON MR. WHYTOCK'S PAPER ON THE CARPET MANUFACTURE.

SIR.—I did not see the number of the *Journal of the Society of Arts* of the 22nd of February, containing an article on the carpet manufacture, by Mr. A. Whytock, until the other day; and although a portion of it, regarding my loom, was, I see, ably answered at the time by Mr. J. Burch, yet I beg to be permitted to offer a few remarks. I have no doubt many carpet manufacturers have felt seriously the introduction of mechanical power to take the place of the old system of hand labour; but still I think any statement made should be tempered by truth. Mr. A. Whytock, in speaking of my power loom, says:—"That of Mr. Sievier is an ATTEMPT to knock up a Brussels pile without the use of the wire, but only APPLICABLE to the weaving of one layer of white and plain worsted warp, presenting a surface afterwards to receive its pattern from the printing of blocks." So far from my loom being only an attempt to beat up a pile, Mr. Burch states that he has printed nearly four million yards with it; and to his able statement I beg to refer your readers. As to the loom being "only applicable to the weaving of one layer of white and plain worsted warp," I think it would not have been a very great stretch of Mr. Whytock's imagination to know that it was immaterial whether the warp was coloured, or patterned, or white. He might as well say, if he had only seen a needle sewing white thread, that it would not sew black. I beg to acquaint him that my loom will and has woven fine framed carpets at an average rate of twenty-five yards daily; and also that it does weave the printed warps, and

fine tapestry for curtains, and covering for sofas, &c., giving eighteen to twenty terrys or loops to the inch, and will weave forty if requisite. It weaves also coach lace. Licenses are let to Messrs. Christy, the eminent manufacturers of Fairfield, Lancashire, whereby the loom weaves Turkish towels, knotted counterpanes, &c. Therefore, so much in answer to its being an "attempt," and weaving only a "plain fabric."

The loom was the first that was ever brought into practical use, and caused a great revolution in carpet weaving, rendering carpets cheap for the million; which has been well carried out by Messrs. Bright, of Manchester, who are always wishing to add comforts to the humble, as well as luxuries to the rich, by a better production. Previous to the introduction of my power loom, 1s. 3d. was paid to the weaver for weaving a yard of cut pile carpet; by the patent loom, the weaver earns better wages at one penny, which is the sum paid, thus saving 1s. 2d. a yard. The ordinary Brussels carpet costs seven-eighths of a penny when woven by the power loom, but by hand it used to cost 1s. A greater saving is made in finer articles—indeed, to an extent of 2s. 6d. per yard.

Since the period of the invention, other ingenious looms have made their appearance; but they use a wire to elevate the pile or loop. They are necessarily complicated and expensive, and more likely to get out of order. I am not saying this in disparagement of any brother inventor, as my patent prevented them from using their ingenuity to weave without the aid of a wire,—a wire having always been necessary in the manufacture of Brussels or piled goods.

I am, &c.,

R. W. SIEVIER, F.R.S.

Old Manor House, Holloway, May 10, 1856.

TONNAGE REGISTRATION.

SIR.—In the *Journal of the Society of Arts* of Friday last, I observe a letter by Mr. Atherton, addressed originally to myself, and published in the *Mechanics' Magazine* on the same day, with certain explanatory remarks appended to it. As it is important that the readers of the letter should be acquainted with at least a portion of those remarks, I shall feel obliged if you will give place in your next number to the following extracts from them:—

"The typographical errors in our note on tonnage admeasurement, in No. 1707, which were inserted in No. 1708, are not, after all, of much importance, and we are unable to discover any further error in the enunciation of Sterling's rule, except that in the 11th line, on page 393, which runs across the page, instead of a_{n+1} , should be read a_{2n+1} —an error which we are convinced would not cause much, if any, inconvenience to the intelligent reader. We have, in our anxiety to keep this note within moderate bounds, (space in our columns being at present in great demand) so far erred in the latter part of it, that we have called that the "curve of sections" which ought to be called the "scale of displacement." The former of the two curves there represented is the curve of sections, and the latter the scale of displacement. However, these two curves have little or nothing to do with the main object of the note. We do not think these errors of sufficient importance to warrant our reprinting the whole note, with its several formulæ, as Mr. Atherton suggests.

"The request that we should introduce textually the rule for calculating tonnage, as deduced from this formula, and legalized by the Merchant Shipping Act of 1854, is, in our opinion, unreasonable. Mr. Atherton, in an elaborate attack upon this rule and other provisions of the Act in question, before the Society of Arts on the 16th of January, contented himself with a mere reference to the objects of his attack, in which course he was doubtless justified, as the persons interested in these matters were of course acquainted with their leading features.

Justice and good faith rather point out the assailant as the person on whom the onus of placing fairly before the public the objects of his attack should fall, than those who merely concern themselves in their defence. * * * * In conclusion, we must remind Mr. Atherton that our criticism on his paper on tonnage appears in a review, and not in the communication

of a correspondent, as he, altogether without reason, intimates; and we are, of course, responsible for that review."

You will perhaps permit me to add that the errors which have given rise to this correspondence are but few, and, as they are chiefly typographical, have no actual bearing upon the criticism preceding the "note" in which they occur. They appeared in consequence of the article being deprived, through an accidental circumstance, of final editorial correction. Those who have had to do with the revision of printed mathematical papers know how difficult it is to secure typographical accuracy in them, even under favourable circumstances, and will not be disposed to over rate the importance of an evident misprint when such occurs.

I am, Sir, your obedient servant,
THE EDITOR OF THE *MECHANICS'*
MAGAZINE.

166, Fleet-street, London,
May 19, 1856.

THE DISCUSSION ON DR. CLARK'S PAPER ON THE WATER QUESTION.

SIR,—In your report of last week's discussion on Dr. Clark's paper, I am represented to have said (in reference to certain waters, the healthiness of which I was comparing) that "the difference between the two waters in question was *only* that one of them contained a large admixture of town-drainage."

For the word "only," in this sentence (p. 440, col. 1, line 2), the word "chiefly" should be substituted; for, although that was, I believe, the *only essential* difference between the two waters, there was a further difference in their saline ingredients, due to the fact that the water polluted by urban drainage was likewise rendered somewhat brackish at each rising of the tide.

I am, &c.,
JOHN SIMON.

REMARKS ON PROFESSOR CLARK'S PAPER, ON MEANS AVAILABLE TO THE METROPOLIS AND OTHER PLACES FOR THE SUPPLY OF WATER FREE FROM HARDNESS AND FROM ORGANIC IMPURITY.

SIR,—Upon the discussion of the above paper read last Wednesday before this Society, Mr. Frederick Braithwaite introduced a table of analyses of different waters, and made some remarks upon the chemists whose results, he said, they were. As many persons may be apt to be misled by the analyses given in this table, and also by the remarks upon them made by Mr. Braithwaite, I think it necessary that I should offer a few observations upon the subject.

In the first place, I would direct attention to the fact that the table contains the analyses of all sorts of waters, as the heading shows, and yet Mr. Braithwaite in discussing the subject, would lead persons to class them as one kind of water only, for immediately following the table of analyses, he says, "The above table showed the results of the analyses of the so-called chalk water made by different chemists, and all differing in their results."

I may state, that by the "so-called chalk water," Mr. Braithwaite means water from the deep wells in the chalk strata under London, and of these deep wells there are many, and at different depths into the chalk, and no two wells contain water of exactly similar composition. The proximity in composition I have ascertained, however, to be regulated a good deal by the proximity of depth from which the water is drawn from the strata. I shall allude to this afterwards.

The water in this strata is peculiar in containing carbonate and sulphate of soda in considerable quantities, together with chloride of sodium, better known to most persons, perhaps, as common salt, and these three salts form about six-sevenths of the whole of the solid matter

remaining when the water is evaporated in a vessel to dryness, whilst the other one-seventh is composed of the other ordinary salts generally met with in water for domestic use.

The peculiarity of the water having so much soda salts in its composition, led a few persons, and amongst the number Mr. Frederick Braithwaite, to maintain most strenuously, on more than one occasion, that the water of these wells was a mixture of upper chalk water with sea water; in fact, that the sea percolated through the chalk into those wells, and the soda salts could come into the water in no other way than from the sea. When Mr. Braithwaite has been opposed in this view—it being chemically impossible out of any admixture of sea water and upper chalk water, to make the deep well water—he has, on more than one occasion, tried to fortify this false position by stating, that, whatever chemists may say, he is right; and as a further proof that he is so, he asserts that the salts of soda are increasing in the deep wells, and that these are supplied from no other source than the sea. In proof of this increase, he has quoted Mr. Brande's analysis of the Trafalgar-square water in 1846, against Messrs. Abel and Rowney's, made upon the same water in 1847. (See *Quarterly Journal of Chemical Society*, vol. i. p. 97.) This latter is the analysis in Mr. Braithwaite's table under the heading "College, 1850." In Mr. Brande's analysis there are more soda salts, but in Messrs. Abel and Rowney's the total saline constituents are slightly greater, and upon this one result alone, a negative one, has Mr. Braithwaite maintained that the salts are increasing in the deep wells under London, and that the source of supply is the sea.

Although I had made many analyses of waters from the deep wells, and some as early as 1844, I did not examine the water in the Trafalgar-square well until 1850, and I then found it to contain, including volatile or organic matter, 61·60 grs. per gallon of solid matter, being a decrease of several grains per gallon from the time when it was examined by Mr. Brande and Messrs. Abel and Rowney. I have examined it repeatedly since, and find a gradual decrease, although it goes on more slowly than at first. My last analysis was made upon the water of July and August, last year, and the solid contents of a gallon at 60° F. were 58·85 grs., being a decrease of upwards of 9 grs. since 1847.

I have not confined my experiments to this well alone, but have examined water from chalk wells in different localities in London, and with the same general result. Hence the difference between Messrs. Abel and Rowney's and my analysis.

In making these experiments, I was led to observe that, as a rule, the shallower the well is in the chalk under London, the less solid matter does the water contain; a fact against the infiltration of sea-water into these wells; for the nearer the wells are to the surface, the nearer they are to the sea, and they would be liable to a larger amount of sea-water, and consequently a greater amount of solid matter, and not a lesser, as I have found them to contain.

Under the joint head of Campbell and Clark, in the table supplied by Mr. Braithwaite, is given, first, my analysis of the Trafalgar-square well water, which is extracted from a paper published in the last number of the *Quarterly Journal of the Chemical Society*, and which I read before that Society, "On the Source of the Water of the Deep Wells under London," and the next analysis is said to be Dr. Clark's. Now this is somewhat curious, as Dr. Clark told me, last year, that he had never analysed it, and I know he has not done so since. Indeed, if you turn to the discussion upon Mr. Homershaw's paper "On the Chalk Strata considered as a Source for the Supply of Water to the Metropolis," which was read before this Society on the 31st January, 1855, you will notice that Dr. Clark, when speaking of the deep well water, in reply to some statement of Mr. Braithwaite's about the water containing 100 grs. of salt per gallon, says, "He had a friend sitting near him who

told him he had accurately examined these waters, and it was no such thing; and, moreover, that a very small portion of salt was present." (See *Journal of the Society of Arts*, vol. iii., p. 180.) Dr. Clark, quoting from a friend as to the quality of this water, is rather a strong proof that he had no data of his own up to that time to go upon, and I am sure that he has not analysed it since.

But I have only to call attention to the analysis quoted by Mr. Braithwaite as Dr. Clark's; and to ask is it likely that such an analysis could be made by Dr. Clark? For Dr. Clark is a chemist, and no chemist ever found the soda salts in the estimated solid matter as bicarbonate of soda; and if Dr. Clark really found 51·3 grs. of sulphate of magnesia (?) in a gallon of water, and only 28·5 of bicarbonate of soda (?), do you think he would say, as Mr. Braithwaite makes him say, namely, that "he found 79 grs. of solid matter to the gallon, consisting principally of soda salts?"

Mr. Braithwaite may confound magnesia salts with soda salts, or do as he likes to make statements suit any theories he may please, but chemists, and I hope the world generally, appreciate Dr. Clark's scientific acquirements too well, and know better than to believe it was possible for him to make such egregious mistakes.

I am truly of opinion that if analyses are extracted from different works, and tabulated for introduction in others, they should be done so with accuracy, and should not be mutilated to be made more suitable for any purpose, at least without a notice that certain things have been left out or certain things changed for others. I am conversant with the greater number of the analyses in the table given by Mr. Braithwaite, and nearly all have been subjected to mutilation or change, my own among the number.

Before concluding these few remarks I would just observe, that Mr. Braithwaite is perfectly wrong in stating that the deep well waters contain no carbonate of lime. There is not one well under London but what does, and there is not one but what shows hardness by the soap test. As I stated on a Committee upon the River Lea Trust Bill, in Commons and Lords, in 1850, the Trafalgar-square water was 5·3 degrees hardness. The water in July and August last year was slightly less hard, being 5·11 degrees. I am sure if Mr. Braithwaite would experiment himself, instead of culling portions of analyses here and there, and speculating upon them when reduced to a tabulated form without any data of how they are obtained, he himself would neither differ so widely from chemists as he now does, nor would he find chemists to differ so widely from themselves as he states.

I am, yours, &c.,

DUGALD CAMPBELL,

Analytical Chemist to the Brompton Hospital,
7, Quality-court, Chancery-lane, May 21, 1856.

Proceedings of Institutions.

YORKSHIRE UNION OF MECHANICS' INSTITUTES.—The nineteenth annual meeting of this Union was held at Middlesborough-on-Tees, on Wednesday in last week, under the presidency of Edward Baines, Esq., the president of the Union; followed by a *soirée*, at which Lord Harry Vane, M.P., took the chair. At the meeting in the morning, delegates attended from the following places:—Batley, Bradford, Bramley, Brighouse, Call-lane, Calverley, Darlington, Eccleshill, Farsley, Gomersal, Grassington, Halifax, Hebden Bridge, Helmsley, Holbeck, Holmfirth, Huddersfield, Leeds, Lockwood, Malzeard, Masham, Middlesbro', Northallerton, Plufforth, Richmond, Ripon, Rotherham, Scarborough, Stockton, Wakefield, Wentworth, Woodhouse, and York. There were also present many of the members and officers of the central committee of the Union, Mr. W. H. M. Blews, Midland

Counties Union, and the Rev. Dr. Booth, F.R.S., Chairman of the Council of the Society of Arts, besides other gentlemen. The proceedings having been opened by the president, it was moved by Mr. Curzon (Huddersfield), and seconded by Mr. Hixon (Holmfirth), that Mr. T. Dawson (Leeds) be appointed auditor of the accounts of the Union. Mr. James Hole, honorary secretary, then read the report of the committee of the Union, of which the following is an abstract:—

The report commenced by advertizing to the appointment of Mr. Barnett Blake as agent and lecturer to the Union, and stated that since the commencement of his labours on the 3rd of March last, he had made 17 visits to the Institutes, as follows:—11 lectures, 2 *soirées*, and 4 conferences. It then expressed the hope of the committee that, during the next winter, they should have the cordial and practical support of the Institutes in carrying into effect the topographical arrangement of the agent's visits, sanctioned at the last meeting of the Union, so that the expense of his visits might be lessened and his time saved. It next spoke in grateful terms of the substantial assistance which Lord Ashburton had signified his intention of affording to the Union. In speaking of the operations of the village library, it was observed that an important element in the success of the library plan would be secured if some arrangement could be accomplished by which lectures could, from time to time, be delivered in the villages. On this point the opinion of the Hon. and Rev. S. Best, as given in his lecture on village libraries, delivered at the Society of Arts Educational Exhibition, was quoted. As one method of doing something in this direction, reference was made to a very valuable adjunct recently introduced by the Lancashire and Cheshire Union. This was the introduction of the magic lantern. By its aid the leading facts of astronomy, physical geography, botany, natural history, and other branches of science, with the remarkable cities and renowned places of the world, could be exhibited in an attractive form. Last year, and during the previous two or three years, a list of gentlemen who had consented to give gratuitous lectures (their travelling expenses being paid by the Institution receiving the lecture) at Institutions in their own neighbourhood, was published. The report of last year contained the names of 74 gentlemen. The Committee believed that the Institutions might derive much greater benefit from this part of the Report, if the respective Secretaries were to furnish yearly a list of all the gentlemen in their own neighbourhood able or likely to assist in this good work. The financial position of the Union, though better than last year, was stated to be still eminently unsatisfactory. The balance due to the Treasurer, W. B. Denison, Esq., was about £20. An additional income of £100 per year was stated to be required, to enable an apparatus like the one in use in Lancashire and Cheshire to be provided; to print a catalogue of the Village Library; and to extinguish a small debt for the purchase of books for the library. The first cost of printing a new Manual for Mechanics' Institutes, including a priced catalogue of books for Institution libraries (now about ready), had also to be met, though ultimately the expense might be repaid by the sale of the work. From the returns which had been sent from the Institutes, the following summary was presented:—

Number of Institutes in the Union	130
Number of Members reported in 75 Institutes—	
Males 14,283	
Females 1,180 —	15,463
Annual income of 75 Institutes	£8,154
Number of Volumes in the Libraries of 78 Institutes	93,768
Number of issues of Books in 78 Institutes	292,140
Average number of times each Book has been issued	3·1
Number of Books added during the year to 68 Institutes	5,198
(Being an increase of 6 per cent.)	
Number of Periodicals taken in 71 Institutes:—	
Weekly 179	
Monthly 490	
Quarterly 79 —	748
Newspapers	609
Number of Lectures delivered at 70 Institutes	694
Of which 126 were paid, and 568 gratuitous, as follows:—	
Scientific	207
Literary	454
Musical	33—694
In 49 Institutes, containing 13,158 Members, the number of Pupils in Classes	4,924

61 Institutes, having 12,460 members, were situated in places having an aggregate population of 555,702, so that one in every 44 inhabitants of those places was a member of a Mechanics' Institute. On a comparison being made between the years 1855 and 1856, it appeared that there had been an increase in the number of members of 1·5 per cent.; of income of 4·3 per cent.; of lectures of 10·4 per cent.; of books of 6 per cent.; of issues, 0·7 per cent.; and in the pupils in the classes to the extent of 49·8. The only decrease was in the number of female members, which in 46 Institutes seemed to have declined about 10 per cent. The report then went on to say, that "the most gratifying fact brought out by these comparisons is, the one showing that in thirty-two Institutes, the number of pupils receiving class instruction has increased nearly 50 per cent. We trust that the managers of every Institution will, without sacrificing any other department, keep this, the principle one, constantly in view. If the classes do not succeed, it is their duty to strictly scrutinize the cause, and to devote their whole energies to its removal. * * * * * If the Mechanics' Institutions are to rise to the position of People's Colleges, and play a worthy part in the educational and social agencies of the nation, nay, even if they are to maintain their present status, and to increase in numbers with the increase of population, though they ought to increase much faster than this, it can only be by becoming educational." This argument, it was observed, became still more imperative, when measured by the exigencies of social life and of productive industry. "As one method of improving the educational organisation of these Institutes, your Committee refer with pleasure to the scheme of examination recently propounded by the Society of Arts, for the members of these Institutions." Not the least hopeful feature of the proposed plan was the fact that 400 of the largest firms in the three kingdoms had declared that they would regard certificates so obtained as testimonials worthy of credit; and it was hoped that the employers in every town would show their sympathy with the cause. If this were done, the scheme would then assume national importance. The report next commented on an important suggestion addressed by the President of the Union to working men, which was "that a canvassing and visiting committee, composed chiefly of working men, and with a considerable proportion of young men, shall be formed every year in every Mechanics' Institution, whose duty shall be, within the first two months of the winter, October and November, to canvass the whole population, and to bring in the greatest possible number of members to the institution." Among the reports from the Institutes, that from Huddersfield was as instructive as usual. Masham reported the erection of a "model institution" at a cost of £700, in memory of their late president, the Rev. Thomas Riddell. At the Leeds Mechanics' Institute there had been a novelty in the shape of a Penny Exhibition of the Fine Arts, to which upwards of 20,000 persons were admitted. The Rotherham and Masbro' Institute had also had a very successful Fine Art Exhibition. The Keighley Institute has been presented by her Majesty's Commissioners of Patents with copies of all the published Specifications and Indexes of Patents, and is providing for their accommodation at an outlay of £60. "The Institutes would do well to secure the custody of these documents for the public use, wherever practicable. The Hallamshire Institution reports that the substitution of efficient paid teachers for gratuitous ones has caused a considerable increase of students in attendance at the classes." One novel method of obtaining new members has been adopted in this Institute, viz., giving prizes to those students who introduced the greatest number of new pupils.

Mr. HOLE next read the report of the Treasurer (W. B. Denison, Esq.), which showed a balance due to the Treasurer of £21 3s. 3d. The deficiency last year was £68 19s. 5d.; so that the funds of the Union are more satisfactory than at the last anniversary meeting. Mr. ISAIAH DIXON (Hon. Sec.) then read the report of the Itinerating Village Library, which stated that, owing to some difficulty in the practical working of the libraries—mainly caused by the want of some means by which the books contained in them could be made known—the number of stations had been reduced from 24 to 11. The issue books of the different stations show that the average circulation for five months of 50 volumes was 197, so that each book was read, on the average, four times. In three instances the libraries had led to the formation of Mechanics' Institutes. With regard to the financial position of the Library, it appeared that last year there

was a balance against it of £43, which had since been reduced by £15. Mr. F. MEWBURN (Chief Bailiff of Darlington) moved, and Mr. JOHN CROSSLEY (Halifax) seconded, the adoption of the report, which was carried. —The PRESIDENT, at this stage of the proceedings, announced that he had received a letter from Lord Ashburton, regretting his inability, from ill-health, to attend the meeting, and enclosing a cheque for £100, to be applied, if thought fit, to the extension of class instruction. The PRESIDENT explained that the original view of Lord Ashburton was to induce Dr. Hodgson to come and lecture at the Mechanics' Institutions of the Union, upon common and practical things, but, most unfortunately, Dr. Hodgson's health had given way, and he was unable to accomplish this object. Mr. THOS. WILSON proposed, and the MAYOR of RIPON seconded, a vote of thanks to his lordship, which was carried by acclamation. The following Institutes were then admitted into the Yorkshire Union: —Normanton Railway Library and Mechanics' Institute, Hepworth Mechanics' Institute, Bentham Mechanics' Institute, Lofthouse Mental Improvement Society, Swanland Mutual Improvement Association, Woodside (Horsforth) Mechanics' Institute. The Central Committee for the next year having been appointed, it was agreed that the twentieth annual meeting should be held at Huddersfield, the numbers being 23 in favour of that place and 19 for Halifax. Thanks having been voted to the gratuitous lecturers, the meeting proceeded to discuss the first subject set down for discussion, which was, "Increase of the rates of subscription paid by members of Mechanics' Institutions." On this point it was stated that the Stockton-on-Tees Institution had increased its rate of subscription, and gained an accession of members thereby. The shortest period for which subscriptions were received was one quarter. In the Huddersfield Institute it was remarked that it had been found advantageous to take fortnightly payments, and in the case of the Leeds West-end Institute, weekly payments had proved most successful. A resolution was then passed, there being only four dissentients, to the effect that the subscriptions in the Institutions generally were inadequate to fulfil the purposes of the Institutions. The next subject was that of the Society of Arts Examinations, which was fully explained by Dr. Booth, the tone of the delegates assembled being very favourable to the scheme. The expediency of appointing yearly a canvassing committee in each Institution then came under consideration. The PRESIDENT explained that by such a system he believed the number of members might be increased five-fold. The principle had been adopted with success by the central committee of the Union, and by the Institutes at Calverley, Holbeck, and other places. The next topic was, "Improvement of Evening Classes, and the employment of paid teachers." The Rev. Mr. BENSTEAD said, he was afraid that the Mechanics' Institutions were likely to be deprived of the services of some of their best paid teachers, especially in villages, viz., the certificated schoolmasters and schoolmistresses. He suggested that a memorial should be presented to the Committee of Council on Education on the subject, but this, it was explained, was beyond the limits of the present discussion. The last subject was, "The establishment of classes for the instruction of females in needlework and plain dress-making;" but this was not discussed, owing to want of time. Lord Harry VANE, M.P., proposed, and the Rev. H. B. BOWER seconded, a vote of thanks to the President, which was carried by acclamation. During the day Lord Vane presented £10 to the funds of the Union.—The delegates then adjourned to dinner, which was attended by about 100 gentlemen, the chair being filled by Mr. Isaac WILSON. After leaving the dinner table, the company proceeded to the extensive ironworks of Messrs. Bolckow and Vaughan, where they witnessed the tapping of a blast furnace, and the running of the molten metal.—The *soirée* was held in the Odd Fellows' Hall, under the presidency of Lord HARRY VANE, who, in his address, re-

marked upon the rapid growth of the town in which they were assembled (Middlesbro'-on-Tees), which he said was due to the enterprise of a great railway company, and to the discovery in its neighbourhood of a bed of ironstone. The town offered an ample field for the exertions of a Mechanics' Institution. He observed that Mechanics' Institutions, properly so called, could only aid the education of the working classes by those classes taking advantage of them, and by the founders of such Institutions taking into consideration the various circumstances of the locality, and the requirements of the particular people for whom they proposed to establish them. He thought that such Institutions should open educational classes, not only for the instruction of the young, but also for teaching those adults whose early education had been neglected—classes, in fact, for elementary instruction—and that the services of competent paid teachers should be engaged. Remarking on the proposed examinations of the Society of Arts, his lordship said, that if this principle were actively carried out, he thought the members of Mechanics' Institutions would see that it behoved them to attempt to attain to those preparatory courses of instruction, without which it would be impossible for them to render themselves equal to competitive examination. The fact of the decrease in the number of females attending the classes, as alluded to in the report, rendered it the more essential that those who thought female education of the highest importance, should press upon all connected with the Institutions the propriety of paying their best attention to this subject.—The Rev. Dr. Booth was then called upon to move the first resolution, which was as follows :—

" That while the necessity of popular education is generally admitted, the instruction imparted at Mechanics' Institutes in those branches of scientific knowledge which are most practically useful, and conducive to social and individual welfare, affords the best proof of the value of such institutions, and their claim to the general and liberal support of the public."

In doing so, he alluded particularly to the subject of female education, urging that efficient classes should be provided in the Institutes for this purpose, so that the female portion of the community might be educated equally as well as the males. The resolution having been seconded by Mr. NEWBURN, was unanimously adopted. Mr. RALPH WARD JACKSON proposed, and the MAYOR OF STOCKTON seconded the following resolution, which was carried unanimously :—

" That the Yorkshire Union of Mechanics' Institutes—by affording the benefits of co-operation to many societies; by collecting and diffusing accumulated experience on the most efficient modes of conducting such institutions; by the employment of an agent and lecturer for the purpose of assisting in the organisation, and promoting the successful operation of Mechanics' Institutes; and by the establishment of circulating village libraries, which has proved successful, in the diffusion of English literature of a sound and healthy character for the purposes of instruction and entertainment, and also by the assistance afforded in the establishment of Mechanics' Institutions—has proved its usefulness and efficiency during the last nineteen years, and thereby entitled itself to the warm support of every friend of popular education, whose sympathy in the cause can best be shown by liberal and regular contributions to the Special Agency Fund."

Mr. EDWARD BAINES then rose to propose the next resolution, which was :—

" That the plan of the Society of Arts of London, for examining and granting certificates to the students of classes for adult instruction of Mechanics' Institutes, and other similar bodies in Union with the Society, which has received the approval of a great number of the leading employers throughout the kingdom, by their declaration to regard such certificates as testimonials worthy of credit, is highly appreciated by this meeting, as being one of the best means to give a practical stimulus to the operations of Mechanics' Institutes; and which is still further enhanced by the valuable prizes offered through the medium of the Society to such students as shall pass the best examination in various departments of literature, science, and the arts."

After speaking of the general progress of these Institutions, Mr. Baines remarked that he could not conceive of anyone doubting the use of these examinations. The effect, he said, of these competitive examinations would be to stimulate the best and most effective department of Mechanics' Institutes—the department of instruction in classes. It was by attending the evening classes that those attainments could be acquired by which persons might pass creditably through an examination, and come out with honour to themselves, as showing that they possessed such qualifications as would justify an employer in receiving them into his service. The most useful part of Mechanics' Institutions were their evening classes, where habits of study and assiduity were formed, and a character acquired at the same time. It was by these examinations that the evening classes would be increased, and that a healthy stimulus would be afforded to the young. It would also be a stimulus to the teachers, who liked to see a plenteous harvest follow their exertions. No other body was so well qualified to conduct these examinations as the Society of Arts. The resolution having been seconded by Mr. JOSEPH PEASE, and supported by the Hon. W. E. DUNCOMBE, M.P., was unanimously carried. Other resolutions of a more formal character having been passed, the meeting separated.

MEETINGS FOR THE ENSUING WEEK.

MON.	Geographical, 1, Anniversary.
TUES.	Royal Inst., 3, Mr T. A. Malone, "On Photography."
	Meteorological, 7 Anniversary.
	Med. and Chirurg. 8 th .
	Civil Engineers, 9, President's Annual Conversazione.
	Zoological, 9.
WED.	London Inst., 3, Professor Rymer Jones, "On Entomology, and the General Organisation and Metamorphoses of Insects."
	Society of Arts, 8, Mr. W. Felkin, "The History and Present State of the Machine-wrought Lace Trade."
	Ethnological, 8, Anniversary.
	Geological, 8, I. Mr. J. C. Moore, "On the Silurian Rocks of Wigtonshire;" II. Mr. C. Babbage, "On the Influence of Ocean Currents on the Formation of Strata."
	Microscopical, 8.
THURS.	Royal Inst., 3, Prof. Tyndall, "On Light."
	Numismatic, 7.
	Antiquaries, 8.
	Royal, 8 th .
FRI.	Royal Inst., 8 th , Dr. Lyon Playfair, "On the Chemical Principles involved in Agricultural Experiments."
SAT.	Royal Inst., 3, "Dr. A. W. Hofmann, "On the Non-Metallic Elements, their Manufacture and Application."
	Royal Botanic, 3 rd .
	Medical, 8.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 10th, 15th, 16th, 17th, and 19th May, 1856.

Par. No.	
195.	Poor Relief (Ireland)—Return.
204.	Secretaries of State—Returns.
166.	Diplomatic Service—Return.
179.	Poor Relief (Scotland)—Return.
218.	Sir Charles Hotham—Copy of a Despatch, &c.
220.	Police Force, &c., Kilkenny—Returns.

PATENT LAW AMENDMENT ACT, 1852.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[From Gazette May 16th, 1856.]

Dated 11th March, 1856.

588.	John Collins, Birmingham—A machine for pulverizing, crushing, pressing, and cleaning land. <i>Dated 31st March, 1856.</i>
774.	Gregory Bird, Glasgow—Improvements in the application of asphaltic or bituminous compositions for building and structural purposes. <i>Dated 19th April, 1856.</i>
945.	William Crosley, 16, Westbourne-park, and George Goldsmith, Leicester—Improvements in wet gas meters. <i>Dated 26th April, 1856.</i>
999.	Thomas Lawes, 32, City-road—Improvements in the construction and manufacture of an implement used in tilling the land.

1001. Malcolm William Hilles, Percy-street, Bedford-square—Improved apparatus, applicable to the treatment and cure of rupture, prolapsus uteri, and other protrusions of the viscera.
 1003. Claude Antoine Arnaud, Lyons—Improvements in obtaining motive power from steam and other fluids, and in pumping and forcing water and other fluids. (A communication.)
 1005. Alexandre Vacherot, Paris—Improvements in the construction of submarine tunnels.

Dated 28th April, 1856.

1007. George Napier, Bath-street, and John Millar, Cavendish-street, Glasgow—Improvements in the manufacture of gas from coal, tar, or other bituminous, resinous, or fatty matter.
 1009. Thomas Restell, New Kent-road—Improvements in fittings or appendages for doors, and in the means of fixing or attaching the same.
 1011. William Denny Ruck, Topping's-wharf, Tooley-street—Improvement in tanning hides and skins.
 Dated 29th April, 1856.

1013. John Hick, Bolton-le-Moors—Apparatus for equalizing the temperature of the water in that kind of steam boilers generally called multi-tubular boilers.
 1015. Thomas Greenshields, 11, Little Titchfield-street—Improvements in sleepers for railways.
 1017. Thomas Webster Rammell, Trafalgar-square—Improvements in pen and pencil holders.
 1019. William Pilling, Oldham—Improvement in the treatment of yarns or threads, and in the apparatus connected therewith.

Dated 30th April, 1856.

1021. John Smith and William Craven, Collyhurst, near Manchester—Improvements in machinery or apparatus for dressing, machining, and finishing velvets, velveteens, and other fabrics.
 1023. Samuel Dyer, Bristol—Improvements in reefing, furling, and setting the sails of ships and vessels.
 1025. Louis Jean Baptiste Manevy, Paris—Improvements in manufacturing cast steel.
 1027. William Edward Newton, 66, Chancery-lane—Improved method of, and machinery for, polishing the surface of glass, stone, metal, or other materials capable of being polished by friction. (A communication.)

Dated 1st May, 1856.

1028. Nathan Defries, Fitzroy-square, and George Henry Bachhofer, Montague-street—Improvements in gas fires.
 1029. Henry Mapple, Childs-hill—Barometers.
 1030. William Edward Newton, 66, Chancery-lane—Improved preparation of phosphoric acid. (A communication.)
 1031. Claude Perron and Victor Boulland, Paris—Improved knitting machine.
 1032. Stephen Carey, Clink-street Wharf, Bankside, Southwark—Improvements in water carts and barrows.
 1033. Richard Archibald Broome, 166, Fleet-street—Improvements in compressing, regulating the pressure and flow of, and conveying gas, parts of which are applicable to air and other fluid pumps. (A communication.)
 1034. Richard Archibald Broome, 166, Fleet-street—Improvements in machinery for felting or "planking" hat bodies. (A communication.)
 1035. Alexander John Paterson, Upper Eaton-street—Improvement in or connected with hawsers and other ropes or chains used in towing vessels.
 1036. Nathaniel Smith, Thrapston, Northampton—Improvements in clo-d-crushing rollers, parts of which are applicable to other descriptions of rollers.
 1037. Augustus Smith, Wentworth-street—Treating vegetable fibres, in order to fit them for use as a substitute for bristles in paint and other brushes.
 1038. Samuel Hunter, 13, Ravensworth-terrace, Gateshead—Improvement in anchors.

Dated 2nd May, 1856.

1039. John Cowley, Quenington, Gloucester—Improvements in the manufacture of paper from straw and other vegetable substances.
 1040. Richard Pearcy, Manchester—Improvements in machinery or apparatus for twisting cotton and other fibrous substances.
 1041. William Waite, 156, Cheapside—Improvement in the construction of sleepers and rails for railways.
 1042. William Naylor, Norwich—Improvements in power hammers and riveting machines, part of such improvements being applicable to the manufacture of bolts or rivets.
 1043. William Day, Campbell-road, Bow-road—Improvements in clo-d crushers or rollers for ruling, pulverizing, or pressing land.
 1044. Alexander Gordon, Fludyer-street, Whitehall—Improvements in evaporating, boiling, and distilling fluids, and generating steam.
 1045. Henry Edward Brown, 2, Summer-street North, Dublin—Improvements in the description of hinges denominated concealed hinges, for carriage doors and doors of every description.
 1046. Samuel Rooke, Birmingham—Improved manufacture of stair rods.
 1047. Richard Archibald Broome, 166, Fleet-street—Improvements in machinery for bending or shaping timber. (A communication.)
 1048. Henry Atwood Thompson, Lewes—Improvements in hay-making machines.
 1049. Robert Tolmie Campbell, Washington, U.S.—Improvements in machines for reaping and mowing. (A communication.)

Dated 3rd May, 1856.

1050. Peter Armand le Comte de Fontainemoreau, 39, Rue de l'Echiquier, Paris—Improvements in electric telegraphs. (A communication.)
 1051. John Wright and Thomas Gorerry, Sheffield—Improvements in railway carriage and other springs.
 1053. Henry Duncan Preston Cunningham, Gosport—Apparatus to be applied to boats to increase their buoyancy and stability.
 1054. Wright Garside, Vicar-street, Kidderminster—Improved method of letting off the worsted or yarn from the bobbins employed in weaving carpets, and other similar fabrics in which bobbins are employed during the manufacture thereof.

Dated 5th May, 1856.

1055. Caleb Bloomer, West Bromwich—Improvements in the manufacture of spikes and bolts.
 1056. George Williams, 16, Cannon-street, St. George's-in-the-East—Improvements in fog and dark night alarm signals.
 1057. William Bulmer and Isaac Sharp, Middlesboro—Improvements in the manufacture of bricks, tiles, and other articles from plastic substances.
 1058. Isaac Holden, St. Denis, near Paris—Improvements in preparing and combing wool and other fibrous substances.
 1059. Alfred Chadburn, Sheffield—Improved construction of pressure gauge.
 1060. William Gregory, Old Church-street, Paddington—Improvement in the construction of roofing tiles.

Dated 6th May, 1856.

1061. Amedée Louis Beudant and Jean Louis Marie Paul Benoit, Paris—Improvements in treating ores of copper containing arsenic and antimony.
 1063. John Wright, Upnor, near Rochester—Improvements in apparatus for lowering ship's boats.
 1065. William Edward Newton, 66, Chancery-lane—Improved apparatus for connecting boats with their tackle, and clearing or detaching them therefrom when lowered from on board ship into the water. (A communication.)
 1067. Thomas Huckvale, Choice-hill, Chipping Norton—Improvements in implements for thinning and hoeing turnips and other crops.

WEEKLY LIST OF PATENTS SEALED.

Sealed May 16th, 1856.

2584. William Cooke.
 2585. William Eassie.
 2596. Joseph Shaw.
 2597. George Collier and James William Crossley.
 2598. George Collier and James William Crossley.
 2601. Josiah Pratt and Thomas Radcliffe.
 2602. William Smith.
 2604. Richard Archibald Broome.
 2613. Francis Puls.
 2618. David Simpson Price and Edward Chambers Nicholson.
 2619. David Simpson Price and Edward Chambers Nicholson.
 2627. William Munslow and Henry Wallwork.
 2649. Jean Lobstein.
 2666. Thomas Allan.
 2704. Richard Hancock.
 2708. William Ward.
 2714. George Harrison and William Mitchell, jun.
 2756. Frederick Samson Thomas and William Evans Tilley.
 2772. Joseph Hacking.
 2796. James Cliff.
 2872. John Hadden, Henry Hadden, Frederick John Hadden, and Charles Staunton Hadden.
 231. Jean Hector Destibeaux.
 476. Frederick Kersey.
 516. Richard Archibald Broome.
 562. Henry Davis Pochin.

626. Robert Walter Winfield John Simms, and Thoma Lloyd.
 634. George Hills.
 658. David Cope.
 Sealed May 20th, 1856.
 2610. John Poole.
 2615. Peter Armand le Comte de Fontainemoreau.
 2616. Charles Frederick Clark and Manoah Bower.
 2631. John Roberts, jun.
 2641. Augustus Dacre Lacy.
 2657. John Wilkes.
 2659. François Coignet.
 2695. James Egleson Anderson Gwynne.
 2699. Pierre Louis Bergeon.
 2713. William Augustus Woodley.
 2715. David Anderson.
 2721. Alexander Watt.
 2725. William Hartcliffe.
 2913. William Symons.
 2917. Richard Archibald Broome.
 2947. William Brown.
 61. Edwin Thomas Truman.
 93. William Owen.
 267. George Hallen Cottam and Henry Richard Cottam.
 393. Edmund Leach, James Leach, and Edmund Leach, jun.
 521. John Greenwood.
 529. Henry Andrew Dewar.
 621. William Edward Yewton.
 631. Charles Randolph and John Elder.
 639. William Graham.
 657. Ely Smith Stott.
 677. John Henry Johnson.
 705. William Foster.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

April 14th.

1545. Henry Goodall.
 May 15th.
 1206. Jean Jacques Joseph Jamain, and Alexander Symmons.
 1215. John Lee Stevens.
 1220. Charles Cowper.

1230. Edward Thornhill Simpson.
 May 16th.
 1222. John Haskett.
 1244. William Fulton.
 1245. Charles De Bergue.
 May 17th.
 1423. Joseph Westwood and Robert Bailie.